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THE FUTURE OF COMMERCE*

BY PHILANDER C. KNOX.

THE future volume, stability and expansion of American commerce depend largely upon the energy and courage of the people, upon their confidence that their government will not disturb unnecessarily the normal laws affecting trade, upon their belief in the government's efficiency to protect them in their rights and upon its willingness to energetically and liberally expand their opportunities.

Last evening in another place I took occasion to discuss the policies of the government in respect to the railroads and their relation to the people and the national authority. This evening, with your permission, I will speak to you of the people's legitimate claims upon the same authority for a broad, systematic, enlightened and liberal policy in developing the tremendous possibilities of the natural highways of the nation.

IMPROVING OF WATERWAYS.

No subject of national policy has been more distorted by partial views, more disfigured by misapprehension, or more dwarfed by the conflict of local interests than the governmental work of improving our harbors and waterways, and yet upon no other one factor does the future expansion of commerce so largely depend. To one element the appropriations for that purpose appear but as a division of spoils. By each particular section its own improvements are regarded as legitimate national claims, while those of other sections may seem to be exaggerated and greedy. The stage has been reached when local jealousies should be cast aside and these limited and partial views enlarged to the perception that whatever expenditure is necessary to bring to its utmost

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economic capacity every harbor capable of commercial utility and every river able to furnish a route for industrial or agricultural products and material, is the most remunerative investment that can be made with national funds. Old methods may have invested these words with local and log-rolling characteristics. The true national policy is to embark on the creation of an inclusive system of harbors and waterways which shall be developed to its utmost economic possibility.

IMPORTANT REASON FOR IMPROVEMENT.

The duty of the government to improve its waterways and harbors is made exigent by the great expenditures in progress on the Isthmus of Panama. Besides the vast general inducement for bringing all our harbors and rivers to their work, in securing to our own people their fair share of the benefits from the inter-oceanic canal is so intimate and weighty that it cannot be neglected with justice to this nation or without discrediting our own intelligence and consistency.

Consider the situation as it presents itself today. We are expending a vast sum of money to dig the Panama canal to a depth of 35 feet. That depth is fixed by the well-established fact that the cheapest ocean transportation is in the great vessels of about that draught. In order that the canal may give the commerce between the Atlantic and Pacific ocean its full development this depth is admittedly necessary. But at the same time only two or three ports of the United States have a depth of water equal to that fixed for the Isthmian canal; and applications of cities to have their harbor channels deepened to that standard are met with procrastination if not refusal. If this is not amended congress

will stand self-convicted of spending the nation's money in digging a canal and confining its fullest benefits to the commerce of other nations, or at best giving to the United States the privilege of using the full depth only through a few ports already notoriously congested.

AN AMAZING INCONGRUITY.

Will the government of this nation through its legislative branches, fix upon itself the amazing incongruity of spending a certain \$300,000,000, and a possible \$500,000,000, in digging the Panama canal and denying to the seacoast harbors of the United States two or three score millions to enable them to enjoy the full benefit of the canal? Do we wish, while spending that sum outside the United States, to withhold or even stint the probable \$200,000,000 or possible \$300,000,000 that will at once secure to the canal the vast traffic of the Mississippi basin, and give to half our population the due return from the contribution to that work? I cannot believe that, with its true nature comprehended, congress can perpetrate that logical impossibility.

The duty of the government to raise its waterways and harbors to their utmost efficiency was determined long ago by the action of the government itself. I assert as an axiom that when the United States government, acting under the legislative grants of congress, first stirred the mud by dredging in the Delaware river or New York bay, it assumed the obligation to keep those harbors up to the standard fixed by the fullest needs of commerce. It invited cities to improve their docks to accommodate large ocean vessels. It held out the inducement to railways to bring their tracks to the water's edge and construct terminals

for the transfer of freight from cars to vessels.

WHERE RESPONSIBILITY LIES.

So when the government assumed charge and control of the navigable streams of the interior it entered into a practical contract with the states and communities bordering these streams that their waterways would be improved to their highest capacity. The states were thereby prevented from improving the streams themselves. Corporate enterprise was forbidden to undertake the canalization of important stretches and fix the cost of their works and franchises on the traffic. The federal government has made its formal and deliberate declarations that it will do this work. That necessarily involves that it will make the improvements adequate to modern needs and possibilities. To do any less would be a mockery and breach of good faith.

The time has come to realize the urgency and importance of this proposition. Beyond the larger importance of cheap water transportation for general commerce and industry, the immediate requisite of securing a full return from the great investment on the isthmus, and indeed the need of giving that canal its full traffic and revenue, establishes as basic in our national policy of internal improvements these propositions:

WHAT SHOULD BE DONE.

First—That we should discard further procrastinations and set about the systematic and comprehensive improvement of all ports and waterways that are or can be made tributary to the canal, in order, if possible, to complete all of them with the completion of the canal; and if that is not possible, to complete the largest proportion possible.

Second—That the maximum depth of the canal should be fixed as the minimum depth of the channels of every sea-coast harbor of commercial magnitude or capable of commercial magnitude.

Third—That all the rivers of the Mississippi basin should be improved to the highest standard of economic utility permitted by their physical and commercial character, and that the lake region should be given access through them to the Isthmian canal and the Pacific by modern and adequate canals, joining Lake Michigan to the upper Mississippi and Lake Erie to the upper Ohio.

To the first and superficial view, the swelling of the Panama expenditure by the sum necessary for this comprehensive and homogeneous improvement of internal waterways may seem a heavy burden. But it is capable of proof that the radical cheapening of transportation by these projects holds out vast returns to this government. Merely as a fiscal prop-

osition it is the best investment of government funds that can be made, and the resources of the government are easily adequate to the prompt and systematic prosecution of the work.

THERE MUST BE A SYSTEM.

This assertion of remunerative return from the expenditure is not predicated upon a system which authorizes a dam at one point at one time and another somewhere else, omitting for decades the connecting improvements necessary to form a continuous transportation route. It does not assert early returns from the method which lets a contract for dredging or construction and then stretches out for years, by restricted appropriations, the work that ought to be done in one or two seasons. It postulates a method by which each route is planned and prosecuted as a whole and carried to early completion as private enterprise pushes its projects, so that the whole enterprise may be brought promptly to the productive stage with the minimum loss from an investment left idle for lack of completion. Nothing is more wasteful or more eloquent of bad business management than partly finished buildings, railroads or waterways left useless and falling into decay.

That modern and improved water routes furnish the cheapest transportation for large masses of fundamental freights on which the time consumed in movement is not vital, is clearly demonstrated by the vast cargoes of ore, coal and grain traversing our lakes and the great tows of coal going down the Ohio and Mississippi rivers whenever the state of water attains a depth of 9 to 12 ft.

CHEAP RATES BY WATER.

The comparative cost is shown by the fact that the charge per ton for carrying coal or ore over the 140 to 150 miles of railroads intervening between Pittsburg and the lake is 20 to 25 per cent greater than the charge for carrying the same freight 1,000 miles on the lakes and 30 to 35 per cent more than the cost of transporting coal from Pittsburg to New Orleans, 2,000 miles by river, when a 12-ft. stage offer the cheapest transportation known in the commercial world.

When such cheapening is effected, what are the results in increase of commerce and industry? Take the case of St. Mary's canal, where the enlargement of a channel formerly doing a large business increased the ore movement 14,000,000 tons or 140 per cent in five years, and the coal movement 3,900,000 tons or 130 per cent in the same time. Take the example of France, the nation which has probably worked out this subject to the furthest results. It is stated by a writer (S. A. Thompson) in the *Engineering*

Magazine to have spent since 1814 \$750,000,000 in improving harbors, in canalizing rivers, and in building canals to connect the rivers, to a total of 7,000 miles of waterways, now furnishing transportation for one-fourth of the internal commerce of that nation. The effect in a broad and stable prosperity is so clearly recognized that a few years ago, when a proposition to spend \$40,000,000 on the waterway from Paris to Rouen was submitted to vote, out of a total of 345,000 only 13 votes were in the negative.

MANCHESTER SHIP CANAL.

The case of the Manchester ship canal has been held up as a vast expenditure from which there has been little return. This is true, in the narrow sense that there have been no dividends on the stock. But set against that these facts: In the few years prior to the opening of that canal the population of Manchester and Salford decreased 60,000; in the 11 years after, their population increased 100,000. Thirteen thousand new houses were erected in that district in three years after the canal went into operation, and prior to the canal era there were many unoccupied ones. The traffic of the canal increased four-fold in 11 years. One authority, speaking of the effect on Manchester as a whole, asserts "It has already saved to the merchants of the city its full cost in freights." The chairman of the Co-operative Wholesale society, who are large shareholders in the canal, stated publicly that though they had received no dividends they had more than recouped themselves for their capital outlay by the saving in freight charges.

Germany's example is at once instructive and inciting. From 1871 to 1900 that government entered into the construction of canals on a considerable scale. Canals were constructed to a total of 1,400 miles, with 1,500 miles of canalized rivers. Navigable rivers were improved and connected. Here are a few leading examples of the results: Increase of the tonnage on the river Main, ten-fold in 10 years; increase of tonnage on the Rhine, passing from Germany to Holland, from 5,392,000 tons in 1889 to 17,239,000 in 1903. The tonnage capacity of vessels on the German canals and rivers aggregated 1,658,266 tons in 1882 and was 4,873,502 in 1902.

WHAT GERMANY HAS DONE.

The result of this on German policy is reflected in a recent step. Under the prevalence of a rather stupid Agrarian idea that waterways benefited manufactures and not agriculture the work was interrupted shortly after 1900. But the benefits have since been so completely demonstrated that the work has been re-

sumed. Within the past 60 days the Prussian parliament has appropriated a total of \$83,000,000 for the renewal of these projects. Germany has about two-thirds the population of the United States and not much over half as much wealth. Her greatest river has about the same length and capabilities as our third-class rivers. Yet this action conveys a lesson to us not only as to our general policy, but as to the particular phases which I urge upon your attention.

The first is that the German canal projects are framed on the plan of extending water transportation to all parts of the empire by connecting the various river and canal routes and uniting them all in one system. The last project of five years ago was the linking of the Rhine with the Dortmund-Emis canal and the latter with the Elbe. The newly-authorized projects include the canal connection of the Rhine and Weser; the improvement of the waterway between the Oder and Weichsel; the canalization of the upper part of the Oder and a canal from Berlin to Stettin.

WHY LAG BEHIND.

The capacities of our internal waterways are almost infinite beside those of the German streams. Our financial ability to plan and make more splendid waterways is indisputable. When German official testimony shows that "the results have always more than justified the expenditures," why should we lag so far behind our opportunities?

But we do not have to go exclusively, or even mainly, to foreign countries for evidence. The work which the United States government has done, limited as it has been by the methods of planning and apportionment, permits, after decades of prosecution, the following summary: A vast proportion of the possible waterways of the country have been neglected or granted improvements of such segregated and scattered character as to accomplish little in the completion of continuous and effective water routes. Another large proportion have received such improvements as to materially enhance their efficiency though by no means up to their full capacity; a third group has been brought nearly or quite to the full degree of utilization. The instance in which any important river, channel or harbor has been improved beyond its availability or in excess of remuneration by enlarged commerce has not, if it exists, come within my knowledge.

RESULTS OF IMPROVEMENTS.

The results of the improvements that have constituted complete and modern facilities afford the basis for comparisons with the incomplete and ineffective. Among the systems that have been

brought to the full modern standard, the four great lakes are prominent. Among those that represent improvements, partial or segregated, the three great rivers are the largest examples. This is not said from any feeling of local jealousy or to impute any charge of favoritism. As will appear hereafter, it leads to an entirely different conclusion. I freely concede that the advanced standard of lake improvements has been secured by the energy and wisdom of the lake interests, backed by the strength and importance of the traffic. But the fact that the lake channels have been improved to a continuous depth of 21 ft. and a large share of the harbors deepened proportionately, gives results which, compared to the interruptions and limitations of commerce on the imperfectly improved rivers, establishes a conclusion which, once seen, cannot be ignored.

Take the eight leading cities of the lake shore and compare their growth of population between 1870 and 1900 with that of the eight leading cities of the Mississippi basin. From this comparison Pittsburg is excluded because its relation to the subject has been that during this period its growth and prosperity have in increasing degree depended on lake transportation, and in constantly decreasing degree on river transportation.

WHAT THE TABLE SHOWS.

The eight other cities of each class present the following showing:

	Lake Cities, Full Improvements.	
	Population, 1870.	Population, 1900.
Chicago	298,977	1,698,575
Cleveland	92,829	381,768
Buffalo	117,714	352,387
Detroit	79,577	285,704
Milwaukee	71,440	255,315
Toledo	31,584	131,822
Erie	19,646	52,733
Duluth	3,131	52,969
	714,898	3,241,273
	River Cities, Inadequate Improvements.	
	Population, 1870.	Population, 1900.
St. Louis	310,864	575,238
Cincinnati	216,239	325,992
New Orleans	191,418	287,104
Louisville	100,753	204,731
Kansas City	32,260	163,752
Memphis	40,226	102,320
Evansville	21,830	59,007
Wheeling	19,280	38,878
	932,870	1,756,932

Observe that in 1870, with one exception, each river city was larger than the lake city of corresponding rank, and that in 1900 all the lake cities, with one exception, were far ahead of the corresponding river cities. In 1870 the eight river cities exceeded the eight lake cities by 218,000. In 1900 the lake cities exceeded the river cities by 1,434,000. The ratio of growth in the river cities for 30 years was 89 per cent; the ratio in the lake cities was 354 per cent.

ABOUT THE LOCAL RIVERS.

To avoid a possible criticism that different conditions in the two sections, apart from navigation, produced this difference in results, let us take another example much less in importance of population, but no less significant in deduction. At Pittsburg, as all know, two streams, the Allegheny and Monongahela, unite to form the Ohio. While these streams and their littorals have many points of distinction, they stood in their original form very nearly on a parity. The Allegheny drains a wider and larger basin. Its low water flow has been demonstrated by engineering tests to be three times that of the Monongahela. The coal resources of the Monongahela basin are more readily developed and superior in extent and quality; but the coal beds of the Allegheny basin are also large, while its resources of agriculture, petroleum and lumber are the greater. The vital difference between them is that the Monongahela was improved by locks and dams a generation ago, while the improvement of the Allegheny is confined to two dams completed within the present decade and carrying reliable navigation about 20 miles up the stream.

The Monongahela river valley had received no slight impetus from its improved navigation prior to 1870, but the most notable industrial growth is recorded in the statistical comparison between that year and 1900. From this comparison Pittsburg and its purely residential suburbs are omitted, since they are affected equally by both streams. But the manufacturing suburbs of that city located on either stream are included, as the transportation of their materials, and in some cases their products, is affected by the cheapness of improved navigation.

GROWTH IN TWO VALLEYS.

The list of cities, boroughs and villages on each river in the census of 1870 and 1900 of over 1,000 population at either date, with their population at both dates, is as follows:

Monongahela River Cities and Towns.		
	Population, 1870.	Population, 1890.
Braddock	1,290	15,654
McKeesport	2,533	34,227
Elizabeth	2,937	7,752
Monongahela	1,078	5,173
Bellevue	906	1,907
California	659	2,099
Fayette City	889	1,595
Brownsville	2,299	2,294
Morgantown (district)....	2,536	5,356
Fairmount (district).....	1,781	10,371
	16,896	86,422
Allegheny River Cities and Towns.		
	Population, 1870.	Population, 1900.
Etta	1,447	5,354
Sharpsburg	2,176	6,842
Parnassus	527	1,191
Parnassus	527	1,191
Freeport	1,640	1,754
Kittanning	1,869	3,902
Brady's Bend and East		
Brady	891	3,619
Parkers	1,399	1,970
Embleton	1,140	1,190

Franklin	3,908	7,317
Oil City	3,298	13,264
Tidioute	1,638	1,237
Warner	2,014	8,043
	19,821	60,885

So far as this comparison goes it shows the Allegheny river towns to have had over 20 per cent larger total population in 1870; but the Monongahela river towns were nearly 40 per cent larger in 1900. But this is incomplete. Between 1870 and 1900 manufacturing towns having no previous existence were built on both rivers, showing the following population in 1900:

Allegheny River Cities and Towns, 1900.	Monongahela River Cities and Towns, 1900.
New Kensington, 4,665	Rankin 3,775
Creighton and	Duquesne 9,036
Natrona 6,320	Homestead 12,554
Arnold 1,426	Monessen 2,197
	Charlevoix 5,930
Total 12,411	Total 27,592

NEW TOWNS NOT COUNTED.

Further than this the towns of Clairton, Donora and Glassport have grown up on the Monongahela since 1900 and have no standing in that census, though they will undoubtedly add from 20,000 to 30,000 to the total of the next census. There is no corresponding increase to this on the Allegheny river, though the extension of the canalization of that stream produces indications of such a growth in the next decade.

In this example it is again seen that at the beginning of the period the unimproved river towns had the larger population; but at the end the improved river towns are 60 per cent the larger. The growth of the Monongahela river towns has been six-fold, that of the Allegheny river towns slightly less than four-fold. This is the result so far as recorded in the census, but well-known growth since then would increase the contrast.

A third example, dealing with what was originally a very unimportant part of lake navigation, but very significant as to the especial point under demonstration, is as follows: In 1870 on the Ohio shore of Lake Erie there were, in addition to the three recognized cities doing a notable lake traffic, seven small ports of varying degrees of unimportance, but having this quality in common, that their share in the large increments of lake commerce was practically nothing. As some of them were then only parts of townships and as others now have more than one municipality in the same district, the township population is given at both dates, together with United States expenditures for harbor improvements prior to 1900, as follows:

WHAT HAS BEEN ACCOMPLISHED.

	1870.	1900.	Expenditures.
Port Clinton	1,246	3,450	\$ 92,000
Huron	1,483	2,434	197,274
Vermilion	1,833	1,937	132,702
	4,562	7,821	
Lorain (Black river, 1870)	838	16,365	342,205

Painesville and Fairport	4,995	9,282	511,308
Ashtabula	3,394	13,987	713,211
Conneaut	3,010	9,525	337,630
	12,237	49,159	\$2,326,330

This I regard as a signal example of the creation of industry and population by harbor improvements. The smallest of these towns in 1870 has been magnified to the largest in 1900 by having been enriched with a harbor of modern and adequate character, and its growth is the phenomenal one of nearly 2,000 per cent in 30 years. Although with that exception the towns having received the greatest harbor improvements were of the largest population at the beginning of the era, the ratio of growth of that group has been about 400 per cent against about 70 per cent for those which have enjoyed less effectual harbor improvements.

It may be easily said with regard to these comparisons that other factors than the improvement of navigation have entered into much of the growth which has most weight in producing these contrasts; and it is not to be denied that there is a color of truth in that assertion. But some of these factors only amount to a removal of the influence of navigation a single step from the direct effect. Thus, it may be said that the reason why Chicago has far outgrown St. Louis is the superior convergence of railroads there from all sections of the west and northwest. But the determining fact in securing that convergence was that they could there reach the principal point of lake shipment for their freight of cereals and provisions.

HARBORS PLAYED A PART.

So, too, regarding the minor lake ports just noted, it is the fact that those of greatest growth had the benefit of railroads connecting them with the interior Ohio and Pennsylvania coal fields and iron manufactures. It is also the fact that the projecting of the railroads influenced the harbor improvements. But it remains the fact that these railroad projects would not have been carried out if the harbor improvements could not have been secured. For the railroad builders knew that without that requisite the handling of the freights which made their lines profitable would have been impossible.

In the comparison of the Monongahela and Allegheny rivers it is an easy claim that the greater growth of the Monongahela river towns was due to their location in the more greatly developed coal and coke fields. But that this is not so paramount a factor as may be thought, is shown by the fact that Uniontown, Connellsville and Washington, located in those fields, but independent of river transportation, show no such excess of growth over Butler, New Castle and Sharon in northwestern Pennsylvania, also without river transportation.

OPPOSED A SECTIONAL JEALOUSY.

I do not support the sentiments of sectional jealousy. That feeling has been one of the chief hindrances to systematic and inclusive waterway improvement. My purpose in presenting these facts is to establish a most pregnant principle which at once proves the needlessness of any sectional conflict and furnishes the most conclusive reason for carrying the improvement of all waterways and harbors to their utmost utility. It is that the contribution of the funds of the whole nation is but a temporary and passing phase, and that these improvements return more than their cost, not alone in their general enlargement of the prosperity and commerce of the nation—which is the largest consideration—but in the narrower fiscal sense of an increase of national revenues that will repay their cost and interest in a comparatively short term of years.

Study the case of the eight lake cities compared with the eight river cities. This does not by any means show all the increase of population along the improved lake waterways. But it shows an increase, in excess of the more normal increase in the river cities of 1,708,565, the gain reasonably attributable to the cheap navigation of the lakes. The average per capita contribution of the people of the states in which these cities are located to the revenues of the United States was \$8 during the two decades prior to 1900 and is nearly \$10 now.

PAY FOR THEMSELVES.

Taking the lower figure to be well within the limits of conservatism, it appears that the gain to national revenue, by reason of the exceptional increase in those eight cities alone, is \$13,668,000. That annual revenue will pay interest and sinking funds to retire in 50 years a bond issue of \$389,000,000, over seven times the cost of the improvements. Putting the whole cost of lake improvements, excluding Lake Ontario, at \$53,000,000 prior to 1900, and ignoring the fact that a large part of this was for minor ports—and some of it wasted—the growth of these cities alone has repaid that cost with interest and has for years been yielding a clear profit to the government.

The expenditure of the Monongahela river, outside of Pittsburgh, prior to 1900 has been about \$5,000,000; that on the Allegheny less than \$500,000. The excess of recorded growth on the Monongahela is 44,000. At the average per capita contribution of Pennsylvania to the revenues, this increase of population yields over 7 per cent on the investment; and the true result is now probably one-half greater. The same test of the expenditures on the four lake ports that have had full improvements, gives a return of 18 per cent on the cost.

OPPOSED TO TOLLS.

The misunderstanding on this point has not been confined to the river section. An eminent and able member of the legislative branch of the government, representing a lake district, with official standing on this very subject, has mooted the proposition that the sections and communities along the streams to be improved shall bear part of the cost of the improvements. The only way in which this can be done effectively and impartially is for congress to impose tolls on the commerce borne by the waterways and harbors constructed in the past as well as in the future. The principle here shown proves not only the lack of necessity, but the positive injury of this course. The government recoups itself for the cost of properly planned and executed improvements within a lifetime. The levy of tolls would be a burden on commerce, and if so ill-judged an experiment should be tried it would demonstrate the converse of the law to which I have alluded, that the decrease of commerce is in manifold ratio to the increase of resistance in the cost of transportation.

But as the returns from the lake improvement and the Monongahela and Kanawha canalizations show that the government need not seek a direct refunding of any part of the cost, they also demonstrate that there is no excuse for hesitation in prosecuting the extension of navigation to other waterways capable of equal or greater development. The Mississippi, Missouri and Ohio rivers promise no less than the lakes did.

COST OF 9-FT. CHANNEL.

The difference in their transportation efficiency, between the present ever-recurring suspensions of navigation and a reliable constant 9 ft. of depth, is greater than the difference between the former 12 to 15 ft. depth of lake transportation and its improved 18 to 21 ft. The natural resources of that great basin will surely bear comparison with those of the lakes. Can anyone who digests the results of the work already done doubt that the proper improvement of such streams would repay the government by enough increased revenue before the child born at its completion would reach middle age? Consider that a \$63,000,000 debt reported by the United States engineers as the cost of improving the Ohio would, for its interest and extinction within an ordinary life, require a fixed charge of \$2,480,000 per year and that the increase of population necessary to yield that enlargement in national revenue is only 310,000. I would not hesitate to guarantee a greater increase within the three counties of Pennsylvania bordering directly on the first 30 miles of the Ohio within 20 years from the completion of the work. And

what is true of the Ohio is true of the rivers and harbors throughout the country.

Government improvement of harbors and waterways judiciously planned to serve large commerce, actual or dormant, and carried to prompt and effective completion will be repaid by the increase of government revenues from enlarged population within the term of a 30 or 40-year bond issue, with a large profit in addition.

COUNSEL OF FISCAL COWARDICE.

It is time to lay aside not only local selfishness and sectional jealousies, but narrow views of the limitation and delay of improvements on account of an erroneous conception of economy for the realization of the vast gain from a waterway scheme truly national in its scope. Nor do the financial aspects of this national plan present any insuperable or even difficult obstacle. The idea that such work must be halted on account of a temporary deficiency in revenues is a counsel of fiscal cowardice. The business man of ability and capital does not on account of anticipated diminution of receipts proceed to starve and stunt his business. He seeks rather the investment of more capital that will enlarge his facilities and increase his revenues. Concede that a very few years' work on this and the Panama project will reduce our overgrown treasury surplus to a margin beyond which it would be unwise to encroach. When that point is reached, what fitter purpose is there for an increase of public debt than the enterprises which will confer greater benefits on future generations than on this one and will repay their cost within the term of a bond issue?

Engineering experts have estimated the cost of such a national system as is here outlined in the neighborhood of \$500,000,000 and, I understand, that total is asked for the various parts which, consolidated, would form this comprehensive whole. Suppose the amount increased for contingent enlargement 50 per cent, to \$700,000,000. Interest and sinking fund charges of 4 per cent would make the annual cost \$30,000,000.

EASY TO CALCULATE.

At the low estimate of \$8 per capita contribution to the national revenues, this would call for an increase of population by this vast expansion of cheap transportation, averaging 3,750,000 during the term of the debt. In other words, the gain of population and revenue needed to make the government revenues whole, would

very little exceed that directly traceable within the past 30 years to the improvements of the lakes and such partial work on the rivers as has attained efficient results. It would be gross pusillanimity to doubt that before the maturity of the debt was half reached, the gain in population and revenue directly due to the work would many times exceed that requirement.

An interest widely classed as prejudiced by and opposed to the comprehensive plan of waterways is that of the railways. But that view is not only prejudiced and selfish; it is absolutely erroneous. True the completion of waterways exercises a regulative effect on railway rates. The partial effect of lake transportation on railway charges so far as it reaches is a recognized factor. The more widespread effect of the system of connected river and lakes with at least two great outlets upon the ocean would work practically universal regulation on through rates between all sections east of the Rocky mountains. But that this would be an injury to the railroads is a narrowly erroneous opinion. It is natural for railroad managers to cling to the immediate profits of exclusive control of business, but a more far-sighted philosophy, backed by actual experience, demonstrates that water competition gives them their most stable prosperity. The features which prove that statement constitute one of the most salient features of our transportation problems during the past two or three years.

RAILROADS NEED ASSISTANCE.

Thirteen years ago an advanced advocate of internal navigation stated the idea that the time was coming when the increase of freight traffic would exceed the capacity of the railroads and that internal waterways should be provided to relieve the railroads of the vast tonnages of coal, iron and grain. The proposition was then decried as visionary. It was verified by the actual facts within 10 years. The railroad statement of the problem of raising \$550,000,000 each year for the next 10 years to keep up to the growing demands of commerce calls up the relevance to that need of the full waterways project. The modern canal of 15 ft. in depth is stated by experts to have a carrying capacity equal to that of 15 double-track railways of equivalent length. The slack-watered river's capacity is limited only by the time consumed in passing vessels through the locks. The capacity of the unobstructed river,

lake channel or ocean harbor is practically unlimited. Putting \$750,000,000 as the cost of an inclusive waterways system against the \$5,500,000,000 needed for railway expansion, it would furnish far greater carrying capacity for the fundamental masses of slow-moving freights, and with the advantage of the government rates of interest at less than one-tenth of the fixed charges.

The relief of the railways by transferring a good share of their low-class freights to the waterways is not adverse to their permanent prosperity. It is a short-sighted notion that they must oppose that change.

WATERWAYS HELP RAILROADS.

European experience has established the law that with waterways carrying the slow and heavy freights, which most congest the railways and on which their net return is the most narrow, the growth of industry and population more than compensates them in the growth of their high-class freight, express, mail and passenger traffic. The deepening of the river Elbe in Bohemia was accompanied by an increase of dividends on the main line of competing railroads to 16 per cent. Two railroads paralleling the river Main from Mayence to Frankfurt opposed its original canalization. When the work was completed their traffic increased 58 per cent in two years, and they joined in petitioning for a further improvement. The Manchester ship canal furnishes to the railroads of that district over 1,500,000 tons of freight per year. In Germany and France it is now a settled policy that the water carriage of low-class traffic gives the railroads their highest revenues from the multiplication of high-class and more profitable business. Progressive railroad men in this country are beginning to recognize this truth.

The New York Central railroad system owes its most profitable traffic to the many cities and towns created along its line by the water competition which it meets all the way to Chicago. M. E. Ingalls and James J. Hill have conceded that the work of waterways would relieve railroads of their congestion and leave them free to greater earnings from more remunerative and less overtaxing traffic.

MUST BE A SYSTEM.

One requisite in undertaking this enterprise alluded to before should be specifically stated. These works of improvement should be carried out on the settled principle of energetic and

continued work for the early completion of continuous routes, in the order of their importance and necessity, and their ultimate connection in a unified system. This does not urge ill-considered haste or lavish recklessness in expenditure. It means the systematic and business-like adoption of the principle that natural powers left idle and large investments in their improvement kept unused for lack of completion is itself unjustifiable waste.

There is a striking illustration of this fact in two assertions made in an article on this topic in the *Atlantic Monthly* of last December by J. L. Mathews. One of them, within the knowledge of every man versed in this subject, is that the plan for the improvement of the Ohio river recommended by Merrill and Weitzel was adopted in 1876; that nine years later one dam was completed, and that in the succeeding 23 years five more dams are just reaching completion, the outcome of 32 years of effort being the improvement of about one-thirtieth of the length of the river. The other assertion I am not in a position to affirm or deny; but its gravity compels attention. It is that the Missouri river commission demonstrated in practice that that stream could be improved to 6 ft. low water depth by re-vestment of its channels; that the commission actually opened the river to that depth for 275 miles from its mouth, and that then "influence was brought to bear at Washington and the scheme was abolished."

HOPES STATEMENT IS UNFOUNDED.

I cherish the hope that the sinister intimation as to the stoppage of this work is unfounded. But the admitted facts show the need of more energetic methods. Here are two streams which with the connecting link of the Mississippi constitute a continuous waterway from east to west, capable of improvement to large utility for a stretch of 1,500 to 2,000 miles; the feasibility and usefulness of this work is demonstrated by actual construction, but the rivers and the sums already invested in them are held dormant and useless simply by the procrastination and vacillations of our governmental methods.

I maintain that the time has come to supplant that system with one designed only to secure business results. Contracts should be let for all the works required to complete each continuous water route. The money for the entire amount of each contract should be made available from bond issues or treasury cash, as rapidly as

the work progresses. Contractors should be awarded a premium for each week gained in advance of the date set for completion and subjected to penalty for each week consumed beyond that date. Appropriations should be made for each homogeneous project without local jealousy and with assurance to every interested section that its legitimate wants will be supplied at no distant day. All to the end that the waste of resources and funds in unreasonable delay shall cease and the era of productive expenditure and full utilization shall be established.

OFFERS GREAT PROSPECT.

In all the range of material benefits for this nation there are none of such magnificent possibilities more certainly attainable than this. The conception of the fields of the northwest linked by waterways with the coal of Pennsylvania, the cotton fields of the gulf, the ports of the Pacific and the cities of the coast; the picture of great tows and fleets of steamers, bearing grain, coal, iron, cotton on the streams from the lakes to the gulf and from Nebraska to New York; the full enjoyment of the Panama canal for the productive interests of the Mississippi basin and the Atlantic coast alike; the agriculture of that vast region doubled in its production by the rewards of intensive cultivation and the multiplication of near markets, surpass the ability of the human mind to grasp in its entirety. But that it can be realized in fact is beyond dispute, when we set about it with the full knowledge of its compelling importance and with the deep resolution to attain it by measures bold without rashness and earnest only to achieve the utmost national welfare.

SUBMARINE SIGNALING.

Officers of the Kaiser Wilhelm II, of the North German Lloyd line, which arrived two days behind her usual time, owing to heavy fog encountered in the North Sea and the English Channel, said it was the efficiency of the submarine signal bell that enabled the liner to take passengers on board at Cherbourg.

"There are no fog horns on the French coast," said Capt. Cuppers, commander of the steamship, "and in the dense fog we had no way of finding the entrance to the harbor, and so had to lie to. Early in the morning we made out the sound of the North German Lloyd tender's submarine bell, fully 10 miles away. All we then had to do was to find her, and this the signal apparatus made comparatively easy."—*New York Herald*.

'BOUT CENTER RANGE.

Messieur Editor MARINE REVIEW:— I see me ver' moch in MARINE REVIEW 'bout center range 'bolishment an' lak few word' in hees regard mese'f.

De argument gains' de center range seem to be raise' account de greediness de center range hog an' damage hees mak for stick so close to center chenal an' mak it some collision. I lak tole you ma frien' dat so long der be commerce, so long der be agriculture, so long der be manufacture so long der be association' of man call' society, so long also der be center range hog.

You ride de wheel, drive nice cheval, run automobile, or pull bell on big steam boat, shees all de sam, you fin' de center range hog.

De center range hog hees uneducate' man, an' is no gentleman, please mak' no mistake dat by uneducate man I mean one not educate in college so to spick. College is good for man specially if hees got it in heem to be good man, den shees bring it out, an' mak' heem ver' good man, an' if hees got it in heem to be fool shees mak him dam fool—maybe plenty facts in head but not education. 'Le Bon Dieu give us some brain' to start wid an' if we invest dose brain' on good security we get 7, 8, 9 per cent interest', dat is education, dat mak progress, dat mak gentleman, dat mak good sailor man. If we tie dem brain up in mouchoir or somet'ing lak dat, wot it say in Good Book, den we get center range hog.

It lissen to me lak dis: W'y not get rid de hog an' keep de ranges? I mak concessions on dis dat it is hard to do but it seem to me dat if Messieurs Wm. Livingstone, Hary Coulby, Harvey Goulder an' plenty nother good vessel man mak cooperation wid de plenty good sailor man in such meeting lak was report in MARINE REVIEW dey may dig up some of dem brain' from de mouchoir an' invest dem, an' if der be some man who has los' mouchoir, brain' an' all it should be dat his boots is place' on de dock.

She is said dat ver' many collision occur during pas' year 'tween Fort Gratiot Light an' Detroit river light; Correc'! but were dey all due to center range? It listen to me not. One case it comes on my min' was happen on center range an' dat was w'en de John W. Moore an' de Queen City—try occupy sam' place at sam' time between Grassy Island an' Mamajuda Lights; dey may be more—I don' recall.

Tuscarora an' Maryland go down in courant rapide near Port Huron, was

dey on center range? Lake Shore an' Fred Pabst come togeder in St. Clair river, an' Fred Pabst sink—is center range to blame dere? Bethlehem an' Australia get mix up an' each fin' sof' spot on bottom St. Clair river. I am tol' dis occur from disable' steering gear (which is argument for install Akers Emergency Steering gear) an' not from center range. Wm. E. Reis an' Monroe C. Smith get mixup an' mak bad collision in St. Clair river, but I don' tink me dat is due to center range. Messieur Jim Davidson' boat (Montezuma, I tink) shees go up de eas' chenal de Lime Kiln Crossing w're shees can steer her possible on center range w're no boat can pass in either direction an' shees completely block chenal for tree, four day; I don' tink dat is due to center range.

Dat bon ami of sailor man, Messieur Col. Chas. E. L. B. Davis, heem wot done so much for aid to navigation in hees destric' have made nice plan for straighten chenal from intersection of Grassy Island Nort' chenal range an' Ecorse range to intersection of Grosse Isle Nort' an' Grosse Isle Sout' chenal ranges. I hope it me dat dis becom' accomplish' soon an' it probably will unless some one got some deed of part of Fighting Island, wot mus' be dredged off, an' he is not able to give it to Uncle Same for a dollar because de legal department don' approve de kin' of ink use' in making out de deed.

In case dis new chenal become' accomplish' dere will be two, tree light house out of business, now it lissen to me w'y not tak' dees light house' an' place dem on sides of chenal, dat is, w'y not mark de axis de starboard and port side all chenal, dat give everybody plenty room an' reduce collision to minimum.

Too moch cannot be spend by government to make de navigation de rivers an' chenals de great lakes so safe as possible, it is not expense it is a good investment. We got good view of working of side ranges on Lime Kiln Crossing las' year, de eas' chenal for up boun' an' de wes' chenal for down boun' boat', bot' marked by ranges; of course der was a stone wall between dem on w'ich de engineers are now working to remove. When dis wall is remove' it will be a nice wide chenal but it is my opinion establish de side ranges.

Please mak no mistake at I criticize anyt'ing advocate' by prominent vessel men whose success an' de success of de lake commerce depend en-

tirely upon de aids to navigation in narrow chenals an' de sailor mans on de boat', an' whose paramoun' interes' is de lives of sailor man an' protection of property.

I simply express my view as it lissen to me an' whoever tak' exception' I beg hees indulgence.

JOE AIGUIERE.

Sheboygan, Wis., Feb. 21.

LAKE LAUNCHINGS.

The steamer John A. McGean was launched at the Lorain yard of the American Ship Building Co. on Saturday last for Hutchinson & Co. of Cleveland. The new steamer is named in honor of the president of the American Linseed Co., of New York, who was, until the Steel Corporation was formed, the manager of the largest single fleet of vessels on the great lakes. Mr. McGean managed the vessels of the Bessemer Steamship Co. for Mr. Rockefeller, numbering 56 in all. Upon the consolidation of the various fleets owned by the underlying companies that formed the United States Steel Corporation Mr. McGean left the lakes to become the president of the American Linseed Co., another Rockefeller concern. He was one of the best-known and best-liked of the men identified with lake commerce. Unfortunately, owing to an accident to his little son, he was unable to leave home to attend the launching. The new steamer was christened by Miss Marie Johnson of Cleveland. The launching party was unusually numerous.

The new steamer is one of the smaller class now building, being 452 ft. over all, 432 ft. keel, 52 ft. beam and 28 ft. deep, having 23 hatches spaced 12 ft. centers. Her engines are triple-expansion with 22, 35 and 58-in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 13 ft. 9 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed 180 lbs. pressure. The McGean will carry about 7,500 gross tons of ore.

The passenger steamer building at the yard of the Buffalo Dry Dock Co., Buffalo, N. Y., for the Lake Erie Excursion Co., was launched on Saturday afternoon last. She will be operated between Buffalo and Crystal Beach. This new steamer is designed exclusively for the excursion trade and is 215 ft. over all, 200 ft. keel, 45 ft. beam and 16 ft. deep. Quite a number of well-known Clevelanders are interested in this enterprise, it being the intention to make Crystal Beach a replica of Coney Island. Bert Rogers is general manager.

NAVAL REPAIR WORK.

Under the provisions of the naval appropriation act for the fiscal year 1908, which provides that the secretary of the navy shall report to congress the number of vessels and their names, upon which any changes or repairs are proposed, which in any case shall amount to more than \$200,000 for each vessel concerned, Chief Constructor of the Navy W. L. Capps has submitted a report to Secretary of the Navy Metcalf for transmission to congress. The vessels enumerated are as follows:

Brooklyn—General overhauling and modernization. Estimated cost, \$275,000.

San Francisco—General overhauling; necessary work for converting into a ship for laying mines. Estimated cost, \$200,000.

Baltimore — General overhauling; work necessary for converting into a ship for laying mines. Estimated cost, \$200,000.

Alabama — General overhauling; modernization. Estimated cost, \$350,000.

Illinois—General overhauling; modernization. Estimated cost, \$350,000.

Iowa—General overhauling; modernization. Estimated cost, \$350,000.

Kearsarge — General overhauling; modernization. Estimated cost, \$350,000.

Kentucky — General overhauling; modernization. Estimated cost, \$350,000.

The following vessels will require repairs which will exceed 20 per cent of the total value of the vessel and will therefore have to be authorized by congress:

Adder—General overhauling; installation of new devices. Estimated cost, \$24,500.

Bennington — General overhauling and minor improvements. Estimated cost, \$75,000.

Grampus—General overhauling; installation of new devices. Estimated cost, \$33,500.

Moccasin—General overhauling; installation of new devices. Estimated cost, \$24,500.

Pike—General overhauling; installation of new devices. Estimated cost, \$33,500.

Paul Jones—General overhauling; minor improvements. Estimated cost, \$25,000.

Col. L. P. Crane has been appointed representative of the Oakland Chamber of Commerce to secure subscriptions for silver service for the armored cruiser California.

ITEMS OF GENERAL INTEREST.

It is reported that the British post office has made a new contract with the Cunard Steamship Company to carry mails between Liverpool and New York for 20 years, the contract to expire in 1928.

The Clyde line freighter Pawnee collided with and sank the ocean going tug Edgar F. Luckenbach in New York harbor a few days ago. Of the 13 men aboard the tug all but one were rescued.

The new gasoline oil barge Contra Costa built at the Union Iron Works for the Standard Oil Co., has undergone her trial trip. This vessel is fitted with two Union gas engines of 250 H. P. She is 188 ft. long, 37 ft. beam and 15 ft. deep.

The address of the San Francisco branch of the Bird-Archer Co. has been changed from 34 Steuart street to 112 Market street. Mr. Harry Hill and Mr. Frank Evers are in charge of the San Francisco office and report a steadily increasing demand for Bird-Archer compounds both for stationary and marine use.

The board of supervising inspectors now in session at Washington have wired the local marine inspector at Tacoma to rescind the recent ruling of Supervising Inspector John Birmingham of San Francisco that the Puget Sound steamers having runs of less than 13 hours' duration might operate without licensed mates.

The new Japanese Tenyo Maru constructed at the ship yard of the Mitsubishi Dock Yard & Engine Works, Nagasaki, for the Toyo-Kisen-Kaisha, will sail for this country on April 11. She is 575 ft. long, 63 ft. beam and 46 ft. 6 in. deep. Her gross tonnage is 14,000 and displacement 21,000. She has turbine engines of the Parsons type.

The navy department has decided upon an experiment to ascertain the effect of gun fire which will be similar to the one recently conducted by the British admiralty in which the old battleship Hero was destroyed. The Monitor Florida is to be made a target for the big 12-inch rifles of a battleship although the fire will be confined to a single turret instead of being directed to demolish the vessel.

Through the *New York Times* lost and found columns an advertiser lately announced a liberal reward to any one picking up a 30-ft. launch equipped with a seven-horsepower engine. The launch had wandered forth in the heavy storm of last week, and was supposed to be somewhere in the vicinity of Sandy Hook. Mariners

were asked to be on the lookout for it.

Representative McKinley, of Illinois, has introduced a bill in congress to erect in the city of Washington a statue to the memory of John Ericsson at a cost of \$50,000. The bill proposes the appointment of a commission to consist of the secretary of war, the secretary of navy, the chairman on the library of the senate and the chairman on the library of the house.

A fine large turbine yacht building for C. K. G. Billings, of the New York Yacht Club, was launched at Glasgow, Jan. 23, and christened Vanadis. She is 396 ft. long, and her gross tonnage exceeds 1,000 tons. The yacht is magnificently appointed, having an owner's suite and eight guest cabins, all upholstered in palatial fashion. The plans for the Vanadis were prepared by a New York firm.

The North German Lloyd Steamship Co. has determined to make the change in the dining saloons of its express steamships from the old system of a "captain's table," and other long tables seating a score or more passengers, to the more modern fashion of putting the passengers at small tables seating two, four, six or eight persons. The innovation was such a success on the Kronprinzessen, the newest of the fleet, that it will now be a feature of all the express steamships of that line.

Secretary of the Navy Metcalf in a report submitted to the senate recently in reply to the charges of the senate committee on naval affairs that "social pull" was the greatest leverage for promotion, and that soft berths ashore went to those who shone with most grace at afternoon teas, shows that the percentage of officers on sea duty is increasing, and that there is a less percentage now ashore than there has been for 10 years past.

A scoop that will cut 10 yards of earth with each dip is to be embodied in the construction of a big dredge to be built at the Richmond, Va., plant of the American Locomotive Co. of New York. The dredge is to be shipped to Alexandria, Egypt, for improvement work on the Upper Nile river. The dredge is to be shipped dismantled, in packages weighing not more than 600 pounds each, for carriage by mules to be site of the improvements.

A new floating dry dock, which will take vessels up to 18,000 tons, has been put in commission at Rotterdam, Holland. It measures 565 ft. over all, has a clear interior width of 88 ft. at

the bottom and 96 ft. at the top, and a height above the floor of 36½ ft. The seven pontoons which float the structure are independent of each other, and can be separately brought up inside the dock. Each pontoon is fitted with two electrically-driven centrifugal pumps. The total weight of the structure is about 6,500 tons.

At a meeting of the shareholders of the North German Lloyd Steamship Co. at Bremen recently a resolution was passed to raise a loan of \$6,250,000 to cover the cost of construction of the two trans-Atlantic liners which were laid down last year. Herr Wiegand, one of the directors, said that the loan had been made necessary by the recent rate war as well as by the situation with regard to competition by a Japanese company in the Far East and the struggle with the English companies for the South American traffic.

It is expected that the report of Rear Admiral Converse, president of the board of construction of the navy, and former head of the bureau of navigation of that department, will be made public shortly. This report has been transmitted to President Roosevelt, at whose request it was made, as a result of the charges of defective battleship construction which have been made so freely of late. The report is stated to be most vigorous and complete and it will show that from the standpoint of structural efficiency the United States navy is one of the best in the world.

There is a growing opposition on the coast to the towing of coal in barges between Boston and Norfolk. Every storm takes its undertow as the barges are not especially seaworthy. Moreover, the system is a menace to navigation as sometimes the hawsers part and sometimes the tugs have to cast them adrift, though it must be said that is the last thing a tug ever does. The sentiment is unmistakably growing in favor of the transportation of coal in steam colliers. The Fore River Ship Building Co. has already built three vessels for this purpose.

At a recent meeting of the American Association of Masters, Mates and Pilots in the city of New York, it was arranged that a monster petition to President Roosevelt is to be circulated praying for the pardon of Capt. William Van Schaick, who has just been sentenced to 10 years' imprisonment for criminal negligence in connection with the burning of the excursion steamboat General Slocum, of which he was in command. Capt.

Van Schaick is 70 years old and it is believed that the president will give serious consideration to such a request.

The naval authorities at Washington have under consideration a plan for the use of a dirigible balloon in some experiments to be conducted at the Washington navy yard in the spring. One of the aeronautic construction companies has offered to supply the department with a balloon for the purpose and if the trials are satisfactory the balloon may be sent to the auxiliary torpedo flotilla on the north Atlantic coast with a view to testing its efficiency in the discovery of submarine torpedo boats. Proposals have also recently been invited for the construction of a dirigible balloon for the use of the army.

The house committee on naval affairs is to receive a special message from Secretary of the Navy Metcalf, urging that the committee insert in the naval appropriation bill, which it is now preparing, an appropriation for \$1,500,000 for the construction of a steel floating dock to be a duplicate of the Dewey, which was built by the Maryland Steel Co., Sparrow's Point, Md., and towed to the Philippines. If the floating dock is built it is to be stationed at Solomons Island, Md., in Chesapeake bay. It is pointed out in connection with this project that not more than two or three of all the dock yards in the country are capable of docking the immense battleships now built and under construction.

A special court was convened at the British consulate at Boston, Mass., for the purpose of investigating the loss of life on the steamer St. Cuthbert, of the Phoenix line, which burned at sea early this month. No blame attaches either to the captain of the ship or to any of the officers for the breaking out of the fire on board. The court is satisfied that the cargo, consisting of fusel oil, matches, naphthol and rags, was properly stowed before the steamer left Antwerp. Fifteen lives were lost in the panic which followed the discovery of the fire, the remainder of those on board being taken off by the White Star line steamer Cymric.

The Mauna Kea, built by the Union Iron Works of San Francisco for the Inter-Island Steamship & Navigation Co. for service among the Hawaiian islands, underwent a successful trial trip last week. The Mauna Kea is the largest of five steamers built by the Union Iron Works for the inter-island trade and is 240 ft. long, 36 ft. beam and 18 ft. 6 in. deep. One of the unique features of this vessel is the poi room, an institution peculiar

to the inter-island traffic. This is for the benefit of second-class passengers whose staple diet this native food is. The Mauna Kea is well provided with surf boats as at some of the ports at which she will stop it will be necessary to land passengers through the surf.

Before the house committee on naval affairs Rear Admiral Capps, chief of the bureau of construction of the navy, recently defended our navy, and said that intelligent criticism is welcomed by technical experts, but that criticism founded upon misinformation, as were the published articles recently, is creative of nothing but public distrust. He admitted that in the Kearsarge and Kentucky the charge that turret ports are so large that when they proceed at full speed bow waves come aboard and flood the handling room were true, but added that since the time of their construction the size of these ports has been reduced. Rear Admiral Capps is preparing and the bureau will shortly publish an official statement covering all of the details involved in these charges.

The New York naval militia is soon to have a much smaller vessel for use as its training ship as the protected cruiser Newark has proven itself entirely too big for the amateur sailors. It is probable that the gunboat Wasp, formerly the private yacht of J. Harvey Ladew, of New York, which has gained fame as the champion recruiting ship of the navy, will succeed the Newark. The Wasp, which is at present at Norfolk under command of Lieut. J. A. Campbell, Jr., was purchased by the government just before the Spanish war for \$94,000. She has to her credit the destruction of the Spanish gunboat Jorge Juan, which she met on July 21, 1898, in Nipe Bay, Cuba. After the war she was brought home and overhauled for a recruiting ship. In the last two years the Wasp has visited nearly every port of consequence on the Atlantic and Gulf seaboards, in addition to extended trips up the Mississippi and Hudson rivers.

The steamer building for Capt. W. C. Richardson at the Cleveland yard of the American Ship Building Co. will be named in honor of Howard M. Hanna Jr., of Cleveland.

Charles J. Colonna, Norfolk, Va., is repairing the schooner Sarah W. Lawrence, which was dismasted and otherwise damaged in a gale recently.



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STEEL STEAMSHIP BONDS AS AN INVESTMENT.

The desirability of the steamship bond as an investment, which has long been recognized on the great lakes, is now being appreciated in other parts of the country, Senator George Davis having introduced a bill in the legislature at Albany to permit the savings banks of New York state to invest in them. The steamship bond has been an especially popular form of investment in Cleveland, the Guardian Savings & Trust Co. alone having placed over \$4,000,000 worth of them. The high standing which they enjoy is exemplified by the fact that they have been sought after by colleges, universities and institutions of a semi-public character, which are naturally very conservative investors.

The first steel ship built upon the great lakes to carry iron ore was

launched about 1885, but it was not until 1890 that steel became the common material for the construction of freighters on the great lakes. Coincident with the adoption of steel for steamship construction came the steamship bond. The life of a steel ship is regarded as indefinite, the classification societies giving a steel ship an A-1 rating for 20 years, and upon the observance of certain conditions at the expiration of that time, renewing the rating for a like period. The hull, therefore, of the steel ship is its own security. The same thing cannot be said of the wooden vessel, which is probably the reason that no wooden vessels are built upon bonds. Since the trust companies of the great lakes began dealing in this form of security over \$20,000,000 worth of these bonds have been sold, and there is yet to be recorded a single instance wherein one of them has defaulted in its own interest account. A very excellent bond indeed is the steamship bond. While a government bond pays from 2½ per cent to 3 per cent, and municipal bonds average from 3 to 4 per cent, a steamship bond pays 5 per cent, and for all practical purposes the security is quite as good.

In financing the construction of a steel freighter on the lakes the common practice is to supply one-half of the sum needed in cash and to secure the other half by a bond issue. In organizing a company, therefore, stock is issued to the shareholders for half the value of the steamer, for which they pay in cash, and a mortgage covering the entire value of the steamer is given to the trust company as security for its loan upon which mortgage the bonds are issued. But it is not to be supposed that a trust company would advance one-half the sum necessary to build the vessel if the hull was its only security. It would still have to face the risk of loss through accident or stress of weather and, if the vessel foundered, its security would have totally disappeared. The mortgage therefore contains the provision that the vessel is to be insured to its full value with the trust

company as beneficiary, the trust company holding the policy. By this means the bondholder is secured from any loss whatever for should the vessel founder the insurance is more than ample to return to him his principal. The bondholder is moreover safeguarded in other ways. The trust company requires to be returned to it quarterly a statement of the earnings and expenses of the vessel in order that it may know precisely whether the vessel is being well managed. The mortgage also stipulates how much indebtedness the vessel may contract while being operated. Any vessel owner who has a bond-built vessel will declare that the company scarcely allows any debt over the ordinary operating expenses. Thus are the bonds safeguarded again for the vessel is practically compelled to operate upon a cash basis. Moreover the bond-built boat is required to be regularly overhauled and all essential repairs made in order that her earning capacity may not be lessened.

Additional security lies also in the fact that the bonds are usually made redeemable only in 10 per cent lots. For instance, if a vessel is bonded for \$100,000 for 10 years, which is the customary period, only \$90,000 worth of the bonds will be outstanding at the end of the first year, and at the end of the fifth year only \$50,000, yet the entire vessel and all its insurance remains as security for the outstanding \$50,000 of bonds. Naturally as each allotment of bonds is retired the outstanding bonds become more and more valuable because the proportion of security is greater while the stock also increases in value, because the interest charges against the ship's earnings are growing rapidly less. The bonds, as stated, bear interest at the rate of 5 per cent per annum. With \$100,000 outstanding the vessel would have to pay \$5,000 interest at the end of the first year, but the interest charge would have diminished to \$2,500 at the end of the fifth year and would become \$500 less for each succeeding year during the five years remaining. It would be a very poor

season indeed when a modern carrier would be unable to meet these charges. Such a season has never occurred, nor is it likely to; yet so thoroughly do the vessel owners appreciate the grip that the trust company has upon their steamers through its bonds that the practice is invariably followed of paying next year's bonds with this year's earnings. A definite sum is annually set aside to meet the proportion of bonds maturing during the following year together with the interest charges upon the entire issue outstanding. By this policy the vessel owner is forever anticipating and providing for the lean year ahead.

The steamship bonds that have been issued during the past 10 years have found their way to the remotest quarters of the country. They are regarded as excellent security by banking corporations and have been purchased by them in preference to government bonds, the collateral being regarded quite as stable and the investment twice as profitable. Many banks in the far west and in the east have invested generously in them. Undoubtedly when there is a better understanding of the nature of these bonds they will be quoted at much higher prices than now. The interest which the steamship bond pays is high considering the absolute integrity of the collateral. It can be recommended as a profitable and desirable investment.

PIG IRON SITUATION.

The principal development of the week was the placing of orders for about 60,000 tons of steel rails; 45,000 from the Great Northern railroad, 6,100 tons from the New York, Ontario & Western railway and 8,000 tons from the Atlantic Coast Line. In spite of irregularities in spots, prices on all lines of iron and steel are being maintained uniformly. The pig iron agreement in the central west is being maintained, but the real market test will be a decided increase in inquiries, which has not yet materialized. Iron is being sold at Birmingham at \$12.25, but \$12.50 is regarded as the usual inside price. The second stack of the Toledo Furnace Co. was blown out this week, and other merchant stacks now accumulating iron will soon swell the idle list. Concessions on prices of forging bil-

lets have been noted in the Chicago territory, but as a rule, prices of billets are well maintained. Rumors of cutting on prices of structural shapes have probably arisen from the low quotations now being made on fabricating and erecting. A slight improvement in the demand for coke is noted in Chicago and Cincinnati, but in the Pittsburg district prices are demoralized and the demand is light.

TRANSFERS OF GOVERNMENT ENGINEERS.

Col. C. McD. Townsend has assumed the duties of government engineer at Detroit succeeding Gen. Charles E. L. B. Davis, retired. This is the most important engineering district on the lakes as it includes control of practically all of the artificial channels through which the commerce of the lakes passes. Col. Townsend has been succeeded at Cleveland by Col. John Millis, whose last assignment was on fortification work in the Philippines. He has been on leave of absence since last October. Col. Millis graduated from West Point in 1880. He has served at New Orleans and Seattle and was for a time secretary of the lighthouse board. Col. Millis is an expert on electrical machinery and represented the United States government in that capacity at the Paris Exposition. He also represented the United States government at the construction of the Assouan dam on the Nile.

TUG FOR STOCK ACCOUNT.

B. J. Cowles, Buffalo, N. Y., has under construction a steel tug boat, being built for stock account. It is 81 ft. long, 20 ft. 1 in. beam and 10 ft. 6 in. deep. The pilot house will be on top of the cabin, beneath which will be the galley. It will be equipped with a fore and aft compound engine, cylinders 15 and 18 in. diameter with a 26-in. stroke; Scotch boiler, 10 by 11 ft., 150 lbs. of steam; Dake steering gear; Chase steam towing machine; and electric lights and search light. Cost, \$25,000.

The tug was launched Feb. 18. The keel of another, also for stock, will be laid. It will be 65 ft. long, 15 ft. beam and 8 ft. deep; have a 16 by 20 engine; boiler 6 by 11, 130 lbs. of steam, of the return tubular type; also Dake steering gear. Cost, \$15,000.

Capt. W. C. Richardson and his daughter, Mrs. T. H. Paine of Ashtabula, left for the south this week, to be gone for several weeks.

AROUND THE GREAT LAKES.

Capt. D. A. Kendall, Algonac, Mich., will sail the steamer Uganda of the Mehl fleet this season.

The committee on harbors of the chamber of commerce of Buffalo has endorsed the recent resolution offered by the counsel of Buffalo that the city purchase the Watson elevator property as a site for a terminal basin in Buffalo river.

Representative Loud has introduced a bill in the house of representatives to appropriate \$200,000 for the construction of a hydraulic dredge to be used by the government engineer in the harbors on the western shore of Lake Huron. The dredge is to be stationed at Bay City.

The annual smoker of the Buffalo lodge of the Ship Masters' Association was held in its quarters at the Chapin block, Buffalo, last week. Much impetus was given to the movement to consolidate the interests of masters and owners by making the owners associate members of the association. Capt. J. J. H. Brown advocated the movement earnestly. Cleveland vessel owners are already members of the Cleveland lodge of the Ship Masters' Association and it is probable that owners in every city where there are Ship Masters' lodges will join them as associate members. The speakers at the Buffalo meeting included Capt. J. J. H. Brown, D. L. Tuttle of the Philadelphia & Reading Coal Co., David Cuthbertson of the Weather Bureau, Capt. George C. Stevenson, Capt. Wm. E. Clark, and Capt. A. B. Drake.

Gen. Charles E. L. B. Davis, who retired for age recently, received word on Saturday last from Washington that the specifications for the work of improving the channel at Middle Neebish, St. Mary's river, have been approved. Bids for the work will be asked for in a short time, though actual operations will not begin until the West Neebish route is opened during the present season. The sum of \$1,250,000 is available for this work. It is proposed to dredge the channel deeper from Hay lake to Mud lake and a minimum depth of about 23 ft. will be provided when the contract is finished. The Middle Neebish channel runs on the east side of the Neebish channel and it was improved several years ago to give a minimum depth of 21 ft. between the upper end of Neebish island and the lower end of Sugar island. The improvement was continued on up the river to deep water in Hay lake about 10 miles below the locks at the Sault.

FOR THE LAKE MARINE

In this department hereafter will be found everything of current interest pertaining to Lake Navigation. Masters are advised to consult it weekly for information of interest to them; and owners are invited to use it freely for the promulgation of all announcements of a general nature. The Marine Review will be placed aboard every vessel having membership in the Lake Carriers' Association, representing a registered tonnage of nearly 2,000,000 tons, and can, therefore, be depended upon as a reliable courier to the entire fleet. It will reach every vessel in active service weekly. It is the intention to make this department complete so that at the end of the year it will be an authentic record which should prove of permanent and increasing value to owners and masters alike.

One of the striking addresses delivered at the annual meeting of the Pittsburgh Steamship Co.'s captains in January last was that of Major Charles Kellar of the lighthouse establishment. His talk was quite comprehensive and instructive in the highest degree. He said:

MAJOR KELLAR'S ADDRESS.

"To explain my connection with navigation, let me open by stating that I am an engineer of the Eleventh lighthouse district, which has jurisdiction of the lighting of the navigable waters of the United States from the mouth of the Rouge river, through Lake Huron and the Straits, to include Round island, to Duluth. In this work I am subject to the orders of the lighthouse board, one of the bureaus of the department of commerce and labor. In addition, I am in charge of the survey of the northern and northwestern lakes and this work is subject to the control of the chief of engineers, United States army, and of the war department. The two offices are separate and distinct, and the funds appropriated for the one may not under any circumstances be used for the other. This, by the way, is one reason why the Lake Survey cannot act upon the suggestion of one of you, who stated that he believed the money spent upon our bulletin might better be devoted to placing a light and fog signal upon Little Pt. Sable, Lake Michigan.

"Many of you are doubtless familiar with the organization of the lighthouse establishment. For the benefit of those who are not, let me explain that the lighthouse service for the United States, Hawaii, Alaska and Porto Rico is under the charge of the lighthouse board. The Philippine lighthouse service is controlled by the Philippine commission. The lighthouse board by law consists of two officers of the navy, two officers of the corps of engineers of the army, two civilians of high scientific attainments, one of whom is usually the superintendent of the coast and geodetic survey, and two secretaries, one an officer of the

navy and the other an officer of engineers of the army. The executive officers of the board are the chairman, who is generally an admiral in the navy, and the two secretaries. The territory under charge of the lighthouse board is subdivided into 16 districts, to each of which an inspector, a naval officer, and an engineer from the army are assigned by the president of the United States. Three of these districts are upon the great lakes—the Tenth with headquarters at Buffalo, the Eleventh with headquarters at Detroit, and the Ninth with headquarters at Chicago, for the inspector, and at Milwaukee for the engineer.

"The inspector of each district is charged with the care and operation of all fixed aids, including the appointments, promotion and discipline of keepers, and the delivery of what are known as regular supplies, such as oil, wicks, chimneys, coal and wood. He also has charge of post lights and of floating aids. The engineer is charged with the construction, repair and maintenance of all fixed aids except post lights. Together the inspector and engineer of each district are charged with the duty of locating new aids and of deciding upon their general nature and characteristics. This brief description shows you where to place the blame for any lack of efficiency. If a light is not burning when it should be, or is burning less brightly than ordinarily, or if a fog signal isn't properly operated, the fact should at once be reported to the inspector of the district concerned. If, on the other hand, a day-mark is not sufficiently conspicuous, due to its form, or if, in your opinion, the illuminating apparatus should be improved in any way, make complaint to the engineer.

"Among other aids in the Eleventh district there are 219 lighthouses and beacon lights, 34 steam fog signals and seven fog signals operated by clock work. To operate these there are employed 185 keepers of all grades whose salaries amount to \$85,000. In addition there are 37 gas buoys and three light-vessels.

"In all upon the great lakes, there are 415 lighthouses and beacons, 84 steam fog signals, 21 mechanical fog signals, 80 gas buoys and 10 light-vessels, constituting two-sevenths of the lights, nearly half the steam fog signals, and more than one-half the gas buoys under the control of the lighthouse establishment.

"For the present fiscal year the total appropriations made by congress for supplies, repairs, salaries of keepers, expenses of light vessels, expenses of buoyage and of fog signals, lighting of rivers, surveys, oil houses, etc., in other words, for the operation and care of all existing aids, amounts to \$3,309,000, not a very large sum when spread over so much territory and so many items of expense. Of this total, the office of the engineer of the Eleventh district received \$85,000 for repairing and improving lights and fog signals, including all related structures, and the inspector of the district received \$159,000 for salaries of light-keepers, expenses of light vessels, supplies, buoyage, etc. In all, therefore, the district received from the annual appropriation \$234,000. It is safe to say that the three lake districts received about \$600,000, nearly one-fifth of the whole annual appropriation. The lakes have, therefore, received their full share of the whole appropriation. In addition, numerous special appropriations for new stations upon the lakes are made. The Eleventh district, for instance, received \$75,000 for Split Rock light station; \$15,000 for ranges at Munising and \$10,000 for two keepers' dwellings. While no tax whatever is laid upon vessels for furnishing these aids, this is by no means the case of foreign countries. In Great Britain light dues on voyages between New York and United Kingdom vary from 4½ to 13¼ pence per ton for entering, as well as an equal charge for departing. This is a state charge, and there is a corresponding local charge, the average total charge per thousand tons seeming to vary between \$40 and \$100 for entry and the same amount for clearing, depending upon the port of entry concerned. The system of light dues seems to be a complicated and vexatious one. Under a newer act there is imposed upon steamers in the British coastwise trade a charge of 3 cents per ton per voyage, with a maximum limit of 30 cents per ton annually. If a vessel makes more than 10 trips, all over 10 are free from light dues. At Bremen the charge is 2½ cents per net ton per voyage, and at Hamburg the charge is about the same. In fact, so far as

known, the United States is practically the only country which charges no light dues.

"Having stated to you the sums which are made available for light-house uses on the great lakes, and they vary but little from year to year, it seems proper to refer to the work which has been done, and which it is proposed to do. During the years 1906 and 1907 the following improvements were made in existing aids: The gas beacon at Two Harbors was replaced by a combined beacon and electric bell; at Michigan Island a new lamp was introduced, greatly improving the light; at Six Mile Point cylindrical towers were substituted for the old skeleton towers; at Pilot Island stone dykes have been built from the island to the lights, so that it is no longer necessary, when cold weather begins, to abandon the fine new range of locomotive headlights which marks the axis of the channel. The old and much poorer range has, therefore, been removed. At Winter Point, locomotive headlights have been substituted for the old lens lanterns and the range lengthened. Channel lights have been placed in the American channel at Stag Island, and at Wind Mill Point the range towers have been replaced by cylindrical steel towers and the lens lanterns replaced by headlights. In addition, much work has been done and the bulk of our time and money spent in small repairs and in work upon dwellings, boat landings, etc., all of which are necessary for proper service. Under special appropriations, Isle Aux Peches range has been pro-



MAJOR CHARLES KELLAR.

vided with permanent substructures for holding the beacons, and Rock of Ages light has been about half finished. At Ft. Gratiot the fog signal has been improved so that it now requires only 15 minutes in place of 45 minutes, as formerly, to put the whistle in operation.

"For the coming season the following improvements to existing aids are proposed: At Two Harbors the present fixed white light of the main light is to be changed to a light flashing red every 5 seconds. At Duluth a light, characteristic not yet decided, is to be placed on the outer end of the north pier. The Rock of Ages light will be completed and put into commission. At Marquette the same change as at Two Harbors will be

made in the main light, and an electrically operated bell, upon a new beacon similar to that at Two Harbors, will be erected on the outer end of the breakwater. The new range, with red headlights in shell towers at Munising will be built, and thereafter the Grand Island Harbor light will be discontinued. The head of St. Mary's river range will be provided with locomotive headlights, and the skeleton towers will be sheathed so as to form better day marks, while the Harwood Point and Dark Hole ranges will also receive headlights. The Bayfield Rock range will be abandoned and the channel limits below the locks defined by placing a red lighted cylindrical beacon on the upper end of the dyke, and a red gas buoy below its lower end to help mark the turn into Little Rapids. The Detour flash lens giving a white flash every 10 seconds has finally arrived, and will be erected early next season. The lights of the West Neebish will be erected, the Isle Aux Peches range will be completed with cylindrical shell towers and acetylene will be used as an illuminant. The front light will flash twice every 10 seconds, the rear one will be a red locomotive headlight. Recent experiments have shown that with acetylene the Wind Mill Point main light can be carried to the gas buoy just below the Flats Canal, and it is the intention to make this improvement. The fog signals at Pt. Iroquois, Whitefish Point and Devil's Island will be improved by

feed water heaters, so that the whistles may be operated in from 12 to 15 minutes in place of 40 to 60, as now. The fog signal at Forty Mile Point will probably be discontinued as useless and transferred to Portage river light station.

"While this is a brief outline of past work and of our plans for the immediate future, a few words of more general value should be added.

"First in importance, seems the matter of the proper use of ranges. This question is of consequence in the Eleventh district only in the St. Mary's river, especially below the canal, where the swift currents and narrow channels make it desirable to use considerable care. So far as the Middle Neebish and Little Mud Lake ranges are concerned, the early opening of the West Neebish channel will greatly simplify matters, as the up and down bound streams of navigation will then be separated, but difficulties will still exist elsewhere, especially where opposing vessels insist on hugging the range. You know better than I how dangerous and aggravating this practice is, and what disasters due to suction sometimes follow. It is, of course, possible to replace the ranges by buoys which are never at their stations at the beginning and close of the season when they are most needed; by double ranges, one for the up-bound, the other for the down-bound stream of traffic, but these would call for entirely new structures, and the purchase of much additional land, etc., finally channel lights upon cribs could be used. It is safe to say that while congress has been very generous to lake interests, until it is proved that the single ranges now existing are absolutely inadequate, there will be very little chance of getting the large sums needed to pay for any one of the substitutes named. But when used with judgment and consideration for the rights of others, the ranges are not really inadequate. The proper and necessary way to use a range is to come on it squarely, and then knowing, either from the buoys, the chart, or from experience, how much the range may be opened, to open it to this extent as promptly as possible. The angle which measures the extent to which a range may be opened depends, of course, upon the width of the channel and the distance from the range lights. I have caused a little table to be prepared showing the angles which a vessel's direction may make with the line of a few of the ranges, and for convenience the figures deduced apply largely to the Detroit river ranges, which are not in

my district. If you will recall that a point is 11 deg. 15 ft., and an eighth-point 1 deg. 24 ft., you will perceive that the angles with one exception, do not rise to a half point and are usually much less than an eighth at the place where a vessel enters the range. A knowledge of these angles will then prove of little practical value. Therefore, the only way in which a range may safely be opened is by experience based upon the proper use of the chart and the limiting channel buoys, and this is a matter that should constantly be borne in mind. If you believe that more buoys are needed to accomplish this result, it will be easy to supply them.

"Wherever fixed lights now exist, especially in harbors and near settlements, it would seem desirable to substitute flash lights for them. Do you desire such a change, and do you prefer the new style flash, as exemplified at Whitefish Point, to the old style as seen everywhere else in the Eleventh district?

"In the matter of day marks, is the new style, consisting of nearly cylindrical shell towers shown at Six Mile Point and Wind Mill Point, preferable to the old skeleton beacons with stalled targets? Finally, at present our fog signals usually give not to exceed two blasts per minute, and these are relatively long. Does this arrangement meet with your approval, and what is your opinion of the new compressed air siren, as exemplified at the Detroit river light station? Does it give as good service as the 10-inch steam whistle?

"This concludes my remarks upon lighthouse matters, and as F. C. Shenchon, principal assistant engineer of the Lake Survey, is here to address you, I shall be very brief in speaking of the survey.

"As you probably know, the lake survey was begun in 1841 and by 1852 the work was regarded as completed. During these years the total appropriations aggregated about \$3,000,000. The result of this work, which was performed with great skill and accuracy, was a series of 76 lake and harbor charts, giving the limits of safe 12-ft. navigation. Unfortunately, while the size and draft of vessels continued to grow, the appropriations after 1882, and practically until 1900, were very small, being little more than the amount needed in publishing new editions of the old charts. By 1900, the need of charts, which should accurately show the limits for present day drafts, had become so pressing that appropriations upon a more liberal scale were re-

sumed, and since then the Lake Survey has been fully occupied in revising and amplifying its charts, so that now we offer you 119 lake and harbor charts, practically all of them modern colored lithographs, showing at a glance the channel depths. Where the old charts have been shown to be in error, and these errors are largely due to the fact that the old Lake Survey lacked certain appliances which are now in use, re-surveys have been made and corrected charts issued. Thus new surveys have been made in the Apostle islands, at the west end of Isle Royale, at Grand Island, at the east end of Lake Superior, in the Straits of Mackinaw, in Green Bay, at the west end of Lake Erie, and at numerous harbors. In addition much work has been done in connection with the measurement of lake outflow, largely with a view to preventing damage to navigation interests by diversions similar to the Chicago drainage canal, and also for the purpose of securing the information needed in the preparation of plans for regulating the levels of Lake Erie, Lake Huron and Lake Michigan.

"The old Lake Survey charts showed depths below a plane determined by the mean lake level during the duration of the survey. If this mean or average level happened to be high, during subsequent low seasons, the charts would show depths greater than were then really available. This, of course, is not what you really need, and at present all our new charts show depths below a mean low water plane, which is lower than any stage which has ever occurred during the seasons of navigation. Thus, Lake Superior charts give depths below a plane whose elevation is 600.56 ft. above mean tide at Sandy Hook. For 47 years the level of Lake Superior between April and December has never been as low as 601, and its present level is over 2 ft. higher than our reference plane. So with Lakes Michigan and Huron, the level of the reference plane is 578.51, and the low water of 1895, the lowest on record, was half a foot higher than this. The November, 1907, level of these lakes was 580.79, also 2 ft. higher than the reference plane for these two lakes. On Lake Erie the level of the reference plane is 569.91, and the present level is 572.37. The general and sectional charts of Lakes Superior, Huron and Erie, show these new reference planes, so that it is safe to say that during the season of navigation our charts always show less water than there actually is. This, you will probably agree, is a step in the right direction.

"During recent seasons the Lake Survey has devoted much energy to a close examination of certain dangerous localities with a view to determining very closely the exact limits of water less than 30 ft. deep. This investigation has been rendered possible at reasonable cost by the use of the wire sweep which Mr. Shenehon will explain to you in detail. We have fixed the limit of our examination at 30 ft., because, as you well know, storms and barometric changes will often render 30-ft. water none too deep for an 18 or 20-ft. boat. This was well shown at Duluth in November, 1905, where some of your vessels struck in 28 ft. of water. In all close places in the open lakes we shall hereafter try to give you the most exact possible information to include a depth of 30 ft.

"During the past season the wire sweep has justified itself in the discovery of dangerous shoals and wrecks not formerly shown on our charts, in the west end of Lake Erie, near Thunder Bay Island and in the Straits. As a consequence of the discoveries in the Straits, new sailing courses have become necessary. These courses and all the shoals and wrecks referred to are indicated upon the charts which will be shown you this morning.

"During the past season the lake survey has endeavored to get important news to you more promptly than hitherto by means of special notices sent to more than 100 newspapers published on the great lakes. It is probable that all news collected by the lake survey, and it is a clearing house in such matters for all engineer offices on the great lakes, has at the earliest possible moment been in the hands of those most concerned.

"For several years past the descriptive matter of our bulletin has shown little change. To prepare the bulletin makes great demands on our office force, and I believe that hereafter it ought to be sufficient to publish an edition of the bulletin every two years, with monthly supplements during the two corresponding seasons of navigation. The supplements will be in more convenient form for transfer of important items to the bulletin, in that they will be printed only on one side of the page and that the space between items will be perforated so that each may be readily detached.

"During the coming season the re-survey of the straits will be completed, and a new survey will be made of the south end of Lake Michigan. We shall then again endeavor to find the shoal reported by Capt. Whitney of

the Morse. In addition, if funds are available, we shall endeavor to give you more complete information concerning magnetic variations in the immediate vicinity of turning points, and upon important sailing courses.

"In closing I wish to say that the lake survey exists solely to fill your real needs, and will always welcome reports of uncharted dangers and wrecks. Please criticize us when we fail to give you what you need. All of you are cordially invited to visit our office in Detroit and to see personally how our charts are prepared."

THE GREAT LAKES REGISTER ADOPTED BY LAKE UNDER- WRITERS AS OFFICIAL CLASSIFICATION REGISTER.

In November last, a meeting of the leading marine insurance underwriters, doing business on the lakes, was held in Cleveland, at which time it was decided to suspend the *Inland Lloyds Register* (which has been carried on in the past as a private register for the benefit of the insurance companies), and to adopt *Great Lakes Register* as the official classification register for all insurance purposes on both hulls and cargoes.

The adoption of *Great Lakes Register* by the underwriters will somewhat change the system of inspection and classification as carried on in the past by *Inland Lloyds*, in so far that if a vessel owner wishes classification in *Great Lakes Register*, it will be necessary for him to make application to the head office of the *Register*, in Cleveland, for inspection of his vessel, when a *Register* surveyor will be sent to examine the vessel and based upon his report, a certificate will be issued by the *Register*, showing the class assigned the vessel. In accordance with underwriters' instructions, *Great Lakes Register* is now notifying all owners to this effect.

The underwriters are anxious to have as many vessels as possible rated in *Great Lakes Register* before the opening of navigation, the vessel owners desiring classification should make application to the *Register* as early as possible, so that the ratings may be before the underwriters when insurance is desired.

Classification in the register will be especially beneficial in obtaining cargo insurance, as it is necessary for underwriters and shippers to know the character of a vessel before assuming the risk. A nominal fee will be charged the owner for the inspection and classification of his vessel.

Great Lakes Register was established in 1896 by F. D. Herriman, under whose management the *Register* has been carried on for the past 12 years, and who

will still remain at the head of the organization as surveyor general.

The offices and officers of *Great Lakes Register* are as follows: Head office, 321 Perry-Payne building, Cleveland, O.; F. D. Herriman, surveyor general; H. N. Herriman, manager; John V. Tuttle, surveyor; Alex. McDougall, surveyor; A. B. Drake, surveyor, Buffalo, N. Y.; John T. Webster, surveyor, Detroit, Mich.; Hugh Calderwood, surveyor, Toronto, Ont.; Richard Fitzgerald, surveyor, Ogdensburg, N. Y.

SHIP YARD NOTES.

Tarr & James, Essex, Mass., are building a fishing schooner of the knock-about type for Captain Brigham, of Portland, Me. The new vessel is very similar to the owner's former vessel, the *Shepherd King*, which was sunk by a Russian steamer last season.

William Cryer, San Francisco, Cal., has been awarded contract by the police committee of supervisors of that city for the construction of a patrol launch to cost \$11,899. The boat is to be ready for use within 90 days from date of contract.

The Marine Railway, Machine & Boiler Works, Baltimore, Md., has secured a contract from Capt. J. H. Riehl of that city for the construction of a 65-ft. tug. The hull contract has been sub-let to M. Mitchell Davis, Solomon's Island, Md., and the machinery will be built in the shops of the contractors.

A new yard for the construction of yachts, boats and other small craft has been established at Seattle, Wash., by Messrs. Wilson, Noyes and Johnson. Mr. Wilson was formerly connected with the Shooter Island Ship yard, Shooter Island, N. Y., as well as with the Palmer Motor Works, Cos Cob, Conn.

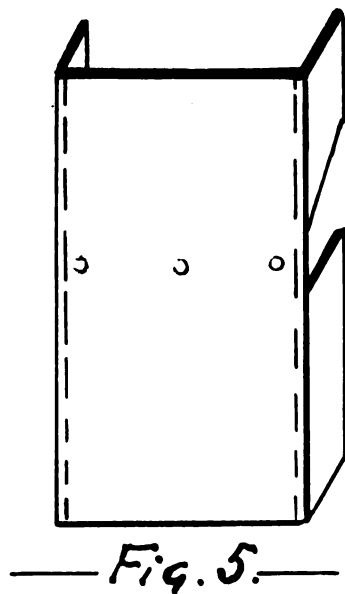
The large six-masted schooner which is being built by Percy & Small, Bath, Me., for J. S. Winslow & Co., Portland, Me., will be the largest wooden vessel and the largest schooner in the world. She is expected to be ready for launching by the latter part of March and will be christened Edward J. Lawrence, after one of her principal owners.

Secretary of the Navy Metcalf has called for estimates for converting the San Francisco, Baltimore and Paul Jones into mine-laying vessels, a type of which the navy would stand in great need in case of war. A special act of congress will be required to authorize the changes as it is known that the 20 per cent limit, above which the law prohibits the cost of remodeling to rise, will be exceeded in these cases.

LAKE SHIP YARD METHODS OF STEEL SHIP CON- STRUCTION.

BY ROBERT CURR.

Shearing strength of $\frac{7}{8}$ -in. diameter rivet equals $\frac{7}{8}$ in. \times $\frac{7}{8}$ in. \times 0.7854 \times 26 = 14.431 tons.



Shearing strength of 1-in. diameter rivet equals 1 in. \times 1 in. \times 0.7854 \times 26 = 20.425 tons.

All rivets, machine driven, thoroughly fill the holes, increasing the diameter of the rivet 1-16 of an inch.

In these example, $\frac{3}{4}$ -in. diameter rivet will equal 12 tons, $\frac{7}{8}$ -in. diameter rivet will equal 15 tons, 1-in. diameter rivet will equal 21 tons.

It is necessary to find the weakest part of the channel in order to form a standard of strength for that section.

The section through rivet holes at main deck, Fig. 5, is the weakest part of the channel.

The inside flange of the channel is cut away to facilitate the fitting, riveting and calking of the watertight collars on the main deck or top of side tank. Four holes, 13-16-in. diameter, are punched, three across the web and one through the shell plating flange and equals 13-16 \times 4 + $2\frac{1}{2}$ = $5\frac{3}{4}$ in. reduced metal at this point. This weakness is overcome by riveting on bracket plates connecting same to frame and tank side top.

The unavoidable weakest section of this channel is taken across the rivet holes at the intercostal clip on the channel side stringer AB, Fig. 6.

The topside channel frame is 12 in. wide and if opened out would measure 16 in. wide by 7-16 in. thick and equal to 7 sq. in., 7 \times 28 = 196 tons, the strength of unpunched material.

The rivet holes across the intercostal

clip of the channel side stringer AB, Fig. 6, reduces the area of section to the extent of 3.25 in.

Example:—Three holes through web and one hole in flange to shell equals 13-16 \times 4 = 3.25 in.

Tensile strength of channel after

punching equals 16 in. — 3.25 in. \times 7-16 in. \times 26 = 154.18 tons.

To determine the number of $\frac{3}{4}$ -in. diameter rivets necessary to fasten these channels together the strength of the metal is divided by the shearing value of the rivets to be used.

The diameter of the rivet is governed by the thickness of material, in this case 7-16-in. thickness calls for a $\frac{3}{4}$ -in. diameter rivet.

154.18

Example: $\frac{154.18}{12}$ = 12.84 rivets $\frac{3}{4}$ -in. diameter.

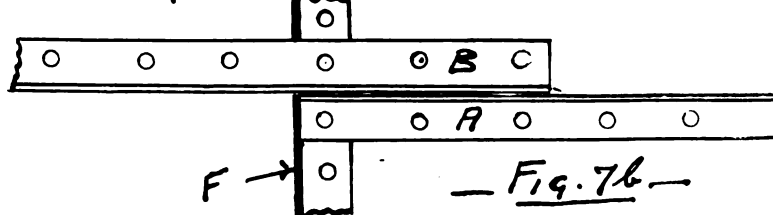
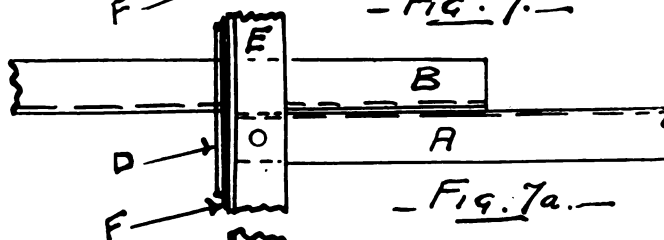
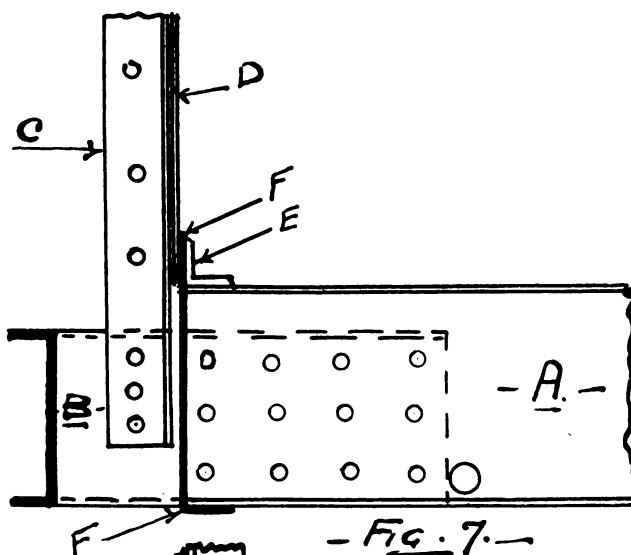
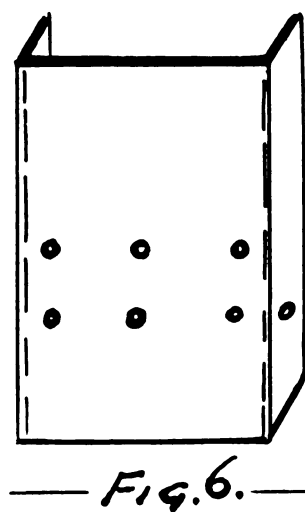
diameter.

Fig. 7 shows the arrangement of rivets to suit this connection as shown by example.

A, Fig. 7, shows the floor channel, B the top side channel, C girder stiffener, D girder plate, E the bottom angle of girder and F the flanged intercostal plate.

Fig. 7a shows plan of top of this lapped butt connection, A is channel floor top flange, B side channel top flange, D girder plate, E bottom girder angle and F intercostal flanged plate.

Fig. 7b shows the connection of the two channels to the shell plating, A being the



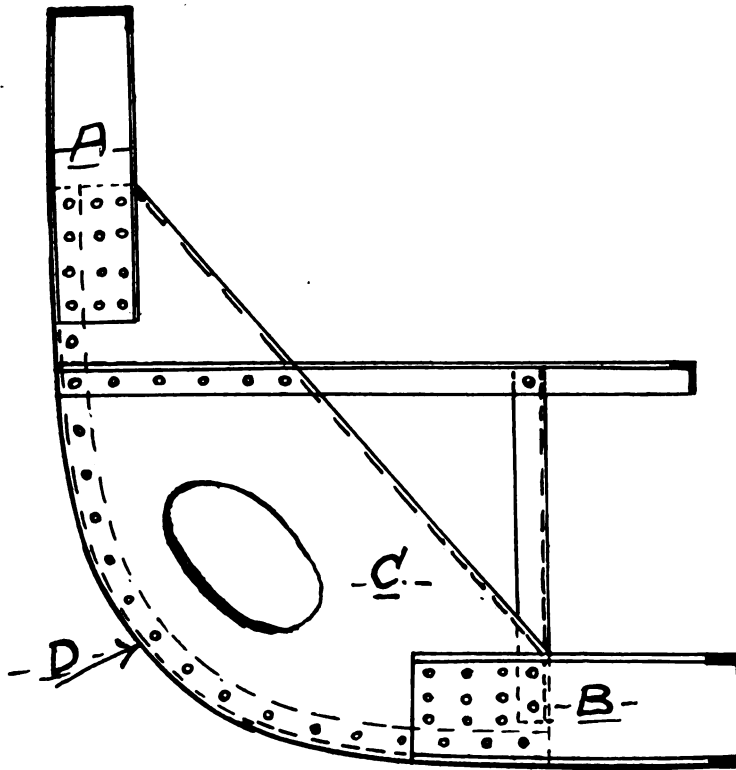
channel floor, B the top side channel and F the flanged intercostal plate.

The relation of the other parts may not be considered although they are related in some way to govern the strength of the riveted butt. It will be seen that there are three rivets in a row in the riveting arrangement and this is governed by the three rivets in the girder stiffener C. The 12 rivets would shear as readily as the breaking of the channel through the girder stiffener rivet holes.

The limber holes in the floor channel are also governed by the three holes for

connected together with a plate bracket C and bilge angle D, which arrangement is cheaper and facilitates the dispatch of the work allowing more men to get at the work.

The rivet arrangement is similar to the connecting together of the two channels, as shown at A, Fig. 8. The bracket plate and bilge angle laps onto the top side channel and floor 18 in. The care necessary in this arrangement is that the plate and angle should have no less metal in any part of section than in a 12-in. channel already referred to.



— Fig. 8. —

the girder stiffener and should not exceed in diameter 13-16 in. \times 3 in. = 27-16 in. and care must be taken not to have the limber holes coming opposite to the shell rivet holes.

The girder stiffeners are not run down to the bottom of the floor channel because it has proven a detriment to the shell plating in cases of grounding. Cases have been discovered where the girder stiffener punched a hole through the shell plating when they were run down to the bottom of the floor.

Another method is practiced in making up the frame of the ship shown by Fig. 8.

Fig. 8 shows the floor channel B running to the ship side beyond the fourth girder and the top side channel A, cut above the line of the tank top.

The top side and floor channels are

The connecting of the channel floor to the center keelson is shown by Fig. 9.

A, Fig. 9, is the channel floor, B the bracket plate, C double angles riveted to center keelson and bracket plate, D tank top stiffener, E center keelson plate, F keel angles, G center keelson top angles, H keel plate and K keel liners.

In the first example twelve $\frac{3}{4}$ -in. diameter rivets govern the number necessary for all purposes and this connection to the center keelson may be the same.

In a case like Fig. 8, where a plate and angle are used, the channel floor may be the first consideration.

The channel floor A when flattened out will measure 19 in. \times 7-16 in. thick and deducting 3.25 in. for lost metal by punching for rivet holes leaves an area of section of 19 in. — 3.25 in. = 15.75 in.

15.75 in. \times 7-16 in. \times 26 = 178.88 tons. tensile strength of channel floor through line of rivet holes for girder stiffener.

Tank top stiffener has an area of section of 1.64 sq. in. and tensile strength of 42.64 tons.

Example:—Tank top stiffener D flattened out measures 6 in. \times $\frac{3}{8}$ in. thick. Two rivet holes 13-16 = 1.63 inches. $6 - 1.63 = 4.37$ in. $4.37 \times \frac{3}{8} \times 26 = 42.64$ tons.

A—Channel floor tensile strength 178.88 tons.
D—Tank top stiffener 42.64 tons.

Floor and stiffener = 221.52 tons.
14 rivets in the floor
A by $\frac{7}{8}$ in. diameter = $14 \times 15 = 210$
3 rivets in tank top stiffener D $\frac{3}{4}$ in. diameter = $3 \times 12 = 36$
246

Shearing strength of rivets in bracket connecting stiffener D and channel A = 246 tons. Rivets exceeds material by 24.48 tons. The rivets connecting the bracket B and angles C are under double shear and have a value of $1\frac{1}{4}$ times the rivets in floor channel A.

Rivets through bracket and double angles at C equals 243 tons, exceeding the material in the channel and angle by 21.48 tons.

Example:— $9 \times 27 = 243$ tons.

The bracket plate through the line of rivet holes has a tensile strength of 405.6 tons.

Example:— $50 - 8.43$ for rivet holes equals 41.57 in. 41.57 in. \times $\frac{3}{8}$ \times 26 = 405.6 tons tensile strength. The two angles of the same thickness as the bracket plate will sum up double that amount which shows that the material in these two cases exceeds the rivets.

The weakest part of the bracket is through the lightening hole which is 321.62 tons.

Example:— 54 in. — $21 = 33$ in. 33 in. \times $\frac{3}{8}$ \times 26 = 321.62 tons.

There are 14 rivets, $\frac{7}{8}$ -in. diameter, connecting the bracket B to the center keelson E, as shown by angles C to E. These rivets come under a tension strain which has a value of 28 tons per sq. in. and in this case equals 238 tons.

Example:—14 rivets by 17 tons = 238 tons.

These calculations illustrate that the rivets are in excess of the material composing the frame of the ship and show a good arrangement of same.

The principle thing considered is the arranging of the rivets without in any way weakening the material.

ANNUAL BANQUET OF THE MARITIME ASSOCIATION OF THE PORT OF NEW YORK.

The Maritime Association of the Port of New York held its annual banquet at the Waldorf-Astoria hotel, Feb. 8, with 230 of the members of the organization present, together with a large number of distinguished guests. President Charles R. Norman presided as toastmaster. Letters of

maritime association to build a replica of Robert Fulton's Clermont to be used in the Hudson river pageant.

William McCarroll, public service commissioner and president of the New York board of trade and transportation, took occasion to criticize the report of the department of public works concerning the building of the barge canal, and also spoke of the merchant marine problem, saying that in some way, through mail subsidies

of the life savers of the coast.

President Douglas, of the Produce Exchange, created much enthusiasm by his references to the fleet under command of Admiral Evans, now on the Pacific, and brought the banquet to an auspicious close with a toast to "Fighting Bob" Evans.

NEW PRESIDENT OF THE MORAN CO.

James A. Moore was recently elected president of the Moran Co., Seattle, Wash., succeeding George H. Higbee, resigned. The active management of the company will remain as heretofore, with J. V. Paterson, the manager, Mr. Moore acting in an advisory capacity. Mr. Higbee's term of office ends in March.

The trustees of the Moran Co. are W. Burton, of Burton, Storrs & Griscom, New York; J. V. Paterson, M. M. Lyter, M. C. Neufelder, James A. Moore, A. Schubach and N. H. Latimer, of Seattle. The Moran Co. is the successor of the Moran Bros. Co., which sold its plant to the Griscom interests a year and a half ago.

RECEIVERS OF MORSE LINES.

The receivers appointed for the Eastern Steamship Co., the Metropolitan Steamship Co. and the Consolidated Steamship Lines, all Maine corporations, were as follows:

Eastern Steamship Co., William T. Cobb, governor of Maine; Calvin Austin, of Boston, president and general manager of all three companies.

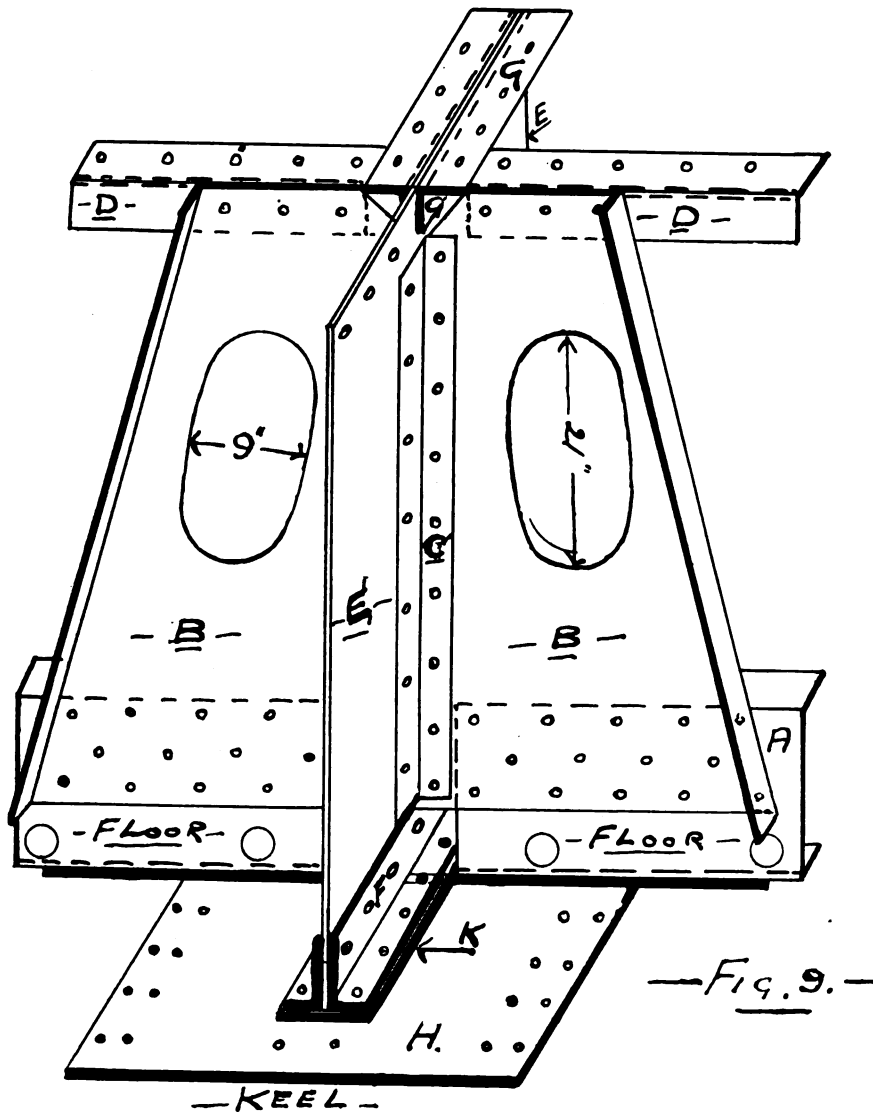
Metropolitan Steamship Co., William T. Cobb, Calvin Austin and A. I. Culver, of New York.

Consolidated Steamship Lines of Maine, William T. Cobb, Gen. Thomas H. Hubbard, of New York, and, in case the latter cannot accept, Robert E. Herrick, of Boston.

Joint special masters, John F. A. Merrill and A. S. Woodman, of Portland.

Congressman Ryan has introduced a bill to establish a light and fog signal ship at Point Abino, Lake Erie, at a cost of \$150,000. This is in Canadian waters but Canada cannot be expected to maintain a light-ship there as nearly all the commerce that passes the point is in American ships.

Capt. R. H. Pardy will sail the Leland S. DeGraff, Capt. J. R. Hesson the William M. Mills and Capt. George H. Lane the William B. Kerr, and Capt. C. E. Sayre the Josiah G. Mann of the Mills fleet this year.



regret were read by Secretary Hinchman from many prominent persons, including Governor Hughes, Secretary of the Navy Metcalf, Secretary Straus, of the department of commerce and labor, Congressman Burton, chairman of the house committee on rivers and harbors, and many others.

The first speaker, General Woodford, told in a brief way of the plans of the Hudson-Fulton commission for the great celebration to be held next year, and in a formal way invited the

or other sensible legislation, means of rehabilitation should be found.

The next speaker was E. R. Sherwood, secretary of the Philadelphia Maritime Association, who told of the cordial relations existing between the organizations and of the improvement to the life saving service and the method of reporting vessels which had been due largely to their efforts.

Other speakers were Dr. Nehemiah Boynton and Justice Walter H. Jaycox, the latter of whom paid a glowing tribute to the efficiency

DEEP SEA NAVIGATION.

State briefly how you work compass error by time azimuth?

You must first determine the apparent time at ship. This may be done in several ways. Correct chronometer time and apply to it the longitude of ship turned into time, this gives mean time at ship; to this apply the equation of time and the result is apparent time at ship.

Example.—Feb. 20, 1908, in Lat. 49° N, Long. 60° W, approximate mean time at ship 7 a. m., chronometer showed 11:30 o'clock, what is the apparent time at ship, with no correction to chronometer?

We must first determine the time and date at Greenwich. We cannot do this by simply noting the time by chronometer (which is always set to Greenwich time), because the Greenwich time, or data in the *Nautical Almanac*, is based upon astronomical time beginning at noon of one day and ending at the noon the next day and is figured from 0 hours to 24 hours, with no a. m. or p. m. to its hours, while the face of the chronometer shows but 12 hours, the same as the ordinary clock or watch. In order to determine the date and time at Greenwich we must first turn ship's approximate civil time and real civil date into astronomical time and date. Thus, 7 a. m., Feb. 20, civil time, is astronomical time and date 19 hours, Feb. 19. This establishes the approximate time and real date at ship astronomically. Now, if it is about 19 hours at ship of the 19th in Long. 60° W, the time at Greenwich must be four hours (Long. turned into time) in advance of the time at ship, or the time at Greenwich must be about 23 hours of the same date as ship's date. This then establishes the date at Greenwich, and that is what we want, so that the 11:30 shown by chronometer is not 11 hours 30 minutes after noon of the 19th at Greenwich, but 23 hours 30 minutes after noon or 30 minutes before noon of the 20th. It must always be borne in mind that the face of the chronometer does not simply show by its hours that the time is after noon of Greenwich. The point to remember is that the ship's time is kept according to civil time, while Greenwich time and the data in the *Nautical Almanac* is for astronomical time, the latter begins at noon and ends at noon and is counted through to 24 hours; while the former begins at midnight and ends at midnight with two 12-hour divisions, one a. m. and one p. m. P. m., civil time, is the same thing as astronomical time, that is, it represents the number of hours after the beginning of the astronomical day. This is because the last half of the civil day is the first half of the astronomical day; in other words, the civil day starts 12 hours in advance of the astronomical day. Then

the first half of the civil day is the last half of the preceding astronomical day. According to this, in turning civil time into astronomical time if the hours are p. m., simply take the p. m. away and the time is the age of the astronomical day, or the number of hours from noon of that day, but when the hours are a. m. add 12 hours to the a. m. hours and set the date back one, also remove the a. m.

Now, when the chronometer showed 11:30 with the ship in Long. 60° W on Feb. 20, we know that the astronomical time at Greenwich is 23 hours 30 minutes of the 19th, and as the time at Greenwich is in advance of any time in west longitude, consequently for a ship four hours west of Greenwich the time must be that many hours behind the time at Greenwich, or 19 hours 30 minutes of the 19th. In other words, the astronomical time at ship is 19 hours 30 minutes of the 19th, or 7:30 a. m. of the 20th civil time.

See Table 1.

Now, with the Lat. of ship, the apparent time and the declination of the body enter the azimuth tables and abreast the apparent time in the same column with the declination will be found the true azimuth. Supposing it were the sun that we were using with the above data; the sun's declination is approximately 11° S. We now look in azimuth table whose latitude and declination are contrary in name, and with Lat. 49° at the top and in the column with 11° declination we run down till we get abreast of 7 hours 16 minutes in the a. m. column. The true bearing that intersects with 7:16 in col-

umn 11° is the true azimuth of the sun. But since the tables give the true bearings for every 10 minutes, if the time falls between the even times we must interpolate for intermediate minutes. Thus, we take out the true bearing on each side of 7:16, that is, for 7:10 and for 7:20

See Table 2.

The bearing is N and E, E because the time is a. m. In other words, the true bearing of the sun in Lat. 49° N, Dec. 11° S and apparent time 7:16 is N $111^{\circ} 33'$ S. Supposing the Var. is 33° Wly, what is the correct magnetic bearing of the sun; and also the compass bearing of the sun was SE, how much and which way is the deviation?

See Table 3.

PROBLEM NO. 5.

On April 23, 1907, p. m., in Lat. $25^{\circ} 40'$ N, longitude by account $84^{\circ} 30'$ W, the sextant angle or rather altitude of sun's lower limb was $25^{\circ} 29' 50''$, index error 0, height of eye 45 ft.; watch time of observation was 4 hours 26 minutes 28 seconds, C-W 5 hours 30 minutes 55.5 seconds, chronometer slow on G. M. T. was 8 minutes 40.5 seconds. At time of observation the sun's center bore per compass S 88° W, ship's head NNE. Variation of locality 14° westerly. Required the longitude and deviation for heading?

The time sight worked out in full:

See Table 4.

For Lat. 26° N, Dec. 12° N and apparent time 4 hours 29 minutes 15 seconds the true bearing of sun in the time azimuth tables gives the same thing, which is a proof on both the time sight and the altitude azimuth.

TABLE 1.

11h 30m	time shown by chronometer, add 12 hours.
12	
23h 30m	astronomical mean time at Greenwich, Feb. 19.
—4h	ship's longitude, west, turned into time.
19h 30m	astronomical mean time at ship.
—14m 1s	equals time taken out for noon of 20th.
19h 16m	astronomical apparent time at ship.
—12h	
7h 16m	civil apparent time at ship, the 20th.

TABLE 2.

For 7:10 it is $110^{\circ} 23'$
For 7:20 $112^{\circ} 19'$

$1^{\circ} 56'$ difference for 10 minutes = $116'$, then for 1 minute the difference is 1-10 of this or $11.6'$

6'

$69.6' = 1^{\circ} 10'$

$110^{\circ} 23'$ for 7:10

$1^{\circ} 10'$ correction by interpolation.

$111^{\circ} 33'$ for 7:16.

TABLE 3.

True bearing	N 111° 23' E	
Variation	33°	Wly
Sun's correct magnetic bearing	N 144°	E
Sun's compass bearing, SE	N 135°	E
Deviation	9°	Ely

TABLE 4.

Watch time	4h 26m 28 s p. m. April 23.		
C-W	5h 30m 55.5s		
Ch. T.	9h 57m 23.5s p. m. at Greenwich.		
Ch. slow	+ 8m 40.5s		
G. M. T.	10h 06m 04.0s = 10.1 hours after Greenwich noon.		
Corr. Eq. T.	+ 1m 37 s		
Gr. A. T.	10h 7m 41 s		
	Eq. T. Diff. 1h 0.499s +		
	10.1		
	5.0399s +		
Eq. time 1m 31.49s		S. D.	15' 56.6"
Corr. 5.03		Par.	8
1m 36.52s = 1m 37s.			+ 16' 04.6
			- 8' 37.6
			+ 7' 26.0"
Dec. Diff.	1h 50.36"	Dip.	6' 36 "
	10.1	Ref.	2' 1.6"
	60) 508.636"		8' 37.6"
	+ 8' 28.6"		
	Obs. Alt.	25° 29' 50"	
	Corr.	+ 7' 26"	
	True Alt.	25° 37' 16"	
Declination	12° 14' 13"		
Corr.	+ 8' 28.6"		
Corr. Dec.	12° 22' 41.6 N		
	90°		
P. D.	77° 37' 18.4"	cosec	0.010215
Lat.	25° 40'	sec	0.04512
Alt.	25° 37' 16"		
Sum	2) 128° 54' 34"		
½ sum	64° 27' 17"	cos	9.63471
	25° 37' 16"		
Diff.	38° 50' 1"	sine	9.79731
	½ sum		2) 19.48736
			9.74368 sine of A. T. at S.
			equals 4h 29m 15s.
Gr. App. time	10h 7m 41s		
A. T. S.	4h 29m 15s		
	5h 38m 26s	difference in time equals longitude of ship in time; west longitude because Gr. T. is greatest.	

QUESTIONS FOR MASTERS AND MATES.—NO. 60.

781. What is middle latitude?
 782. What is co-latitude?
 783. What is a great circle?
 784. What is an acute angle?
 785. What is an obtuse angle?
 786. What is the complement of 38°?
 787. If the latitude is 46° N, what is the co-latitude?
 788. What is polar distance?
 789. The latitude is 44° N, and the declination of a star is 62° N, what is its polar distance?
 790. What is the altitude of a celestial body?
 791. What is the meaning of meridian altitude?
 792. Explain what latitude is.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

401. Why is it that degrees on the compass are reckoned from N or S?
 402. What are the 90-degree courses?
 403. How many 8-point courses are there?
 404. How many 3-point courses are there?
 405. How many 11¼-degree courses are there?
 406. How many pounds in a gross ton?
 407. How many pounds in a net ton?
 408. How would you convert gross tons into net tons?
 409. How would you convert net tons into gross tons?
 410. How many points in 202,500"?
 411. How many feet in seven nautical miles?
 412. How many points of the horizon does a side light show?

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

379. S ¼ W.
 380. Because it is midway between E and SE.
 381. Because it is ½ point to the westward of WNW.
 382. 4½ points.
 383. 87° 11' 15".
 384. From N and S points of the card.
 385. Because they are the reckoning points. All direction is measured from the meridian to begin with.
 386. About 1½ points.
 387. 14¼ points.
 388. 70° 18' 15".
 389. SE by S.
 390. About 2¼ points.

5h	4)38m(9°	4)26s(6'
15	36	24
75°	2 × 15 = 30'	2 × 15 = 30'
9	6'	
84°	36'	
Long. 84° 36' 30" W.		
The altitude azimuth:		
P. D.	77° 37' 18.4"	
Lat.	25° 40' sec	0.04512
Alt.	25° 37' 16" sec	0.04494
	2)128° 54' 34.4"	
½ sum	64° 27' 17.2" cos	9.63471
	77° 37' 18.4"	
Diff.	13° 10' 1.2" cos	9.98843
	2)19.98843	
	9.85660 cos of ½ angle of	
	true azimuth, equals	
44° 3'		
2'		

N 88° 6' W true azimuth, reckoned from north because in north latitude and west because the observation was made in the afternoon.

Sun's true bearing N 88° W
Variation Wly — 14°

Corr. Mag. Az. N 74° W
Compass Az. N 92° W

Deviation 18° Ely for ship's head NNE.
S 88° W as an azimuth is N 92° W.

NOVEL FEATURES OF NEW SUBMARINE.

"If Simon Lake's latest undertaking is successful, and there is every reason to believe that it will be," said an American submarine officer recently, "the United States will soon own a submarine that will break speed records on the surface of the water, that can steam 70 consecutive hours beneath the surface, and, if necessary, can run on wheels on the bottom of the ocean."

This is a brief description of the wonderful 500-ton submarine cruiser that Simon Lake, an early designer of submarine torpedo craft, has undertaken to build for the American navy. Lake has agreed that if the vessel to be built by the Bath Iron Works should fail to meet all the specifications the government need not buy her. On the other hand, if she does come up to specifications, the government has agreed to pay \$450,000 for her.

The new submarine cruiser will be over twice as large as the biggest submarine now owned or building for the navy. The government has stipulated that she must have a surface speed of 14 knots an hour. Mr. Lake, on the other hand, expects

the craft to develop 16 knots on the surface and a submerged speed of 9 5/10 knots.

This wonderful craft will be 161 ft. long. She will displace in tons nearly seven times as much as the Holland, over four times that of the Porpoise and Plunger, and about three times that of the newest type American submarine represented by the Octopus.

The new submarine will probably go into commission in May, 1910, and it is said for her that she will when ready for sea have a surface steaming radius of over 3,000 miles. She is expected to be able to maintain a submerged speed of over nine miles for 70 consecutive hours, while, if necessary, she will be able to roll along the bed of the waters in which she is submerged for several hours, on wheels that are to be fitted to her bottom for that purpose.

The Lake vessel will not dive, but will rise and sink with an even keel. She will be fitted with six torpedo tubes, two more than the largest American submarines now carry, and will have 10 torpedoes, each one of sufficient power to sink any battleship afloat. The new submarine will be equipped with a door in

her bottom, by which a diver may get out without allowing water to enter the vessel. This is expected to prove of great service in the search for submarine mines and the exploration of sunken wrecks.

The boat will be driven by gasoline, and she will be able to cross the Atlantic under her own power if she comes up to expectations. Great Britain is also said to be building submarines of a large type, while France is reported to have two, that will displace 800 tons, under construction.

OCEAN RATE WAR AT END.

It has been officially announced that as a result of the steamship conference in London early in the month a three years' agreement has been arranged by which all trans-Atlantic lines will have uniform saloon rates all the year round, no rebates being granted on first and second-class return tickets as has been the practice hitherto.

The Canadian lines, however, will have the option of making a reduction of 30 shillings for the winter season. Third-class rates are back to the old basis, and first and second-class minimum rates are generally one pound higher than before the cutting began, but all fares on the Cunard line's steamers *Lusitania* and *Mauretania* are higher than on other steamers.

The following are understood to be the new rates: *Lusitania* and *Mauretania*, first class, £26 10s; second class, £12. *Kronprinzessin Cecilie* and *Kaiser Wilhelm II*, £25 10s; second class, £12. *Kaiser Wilhelm der Grosse*, *Kronprinz Wilhelm* and *Deutschland*, £23 10s; second class, £12. *Adriatic* and *Amerika*, £22 10s; second class, £11. The rates are fixed on a gradually descending scale to £17 10s for first class on the steamers of the Canadian Pacific Railway and Allan companies and £9 10s for second class on these liners.

It must be remembered with reference to a differential on the *Lusitania* and *Mauretania* that the difference on the railway fare between London and Liverpool and London and Southampton is a natural differential in favor of the German lines amounting to from 1 to 18 shillings.

The Cunard liner *Lucania* went aground near Sandy Hook last week while trying to dodge an oil steamer in the narrow channel. The accident was due to a dense fog and while the *Lucania* got off an hour afterward the oil steamer, the *Deutschland*, did not escape so easily having gone aground and damaged some of her bottom plates. She was forced to put back to port in a leaking condition.

ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The new steamer *Suriname*, of the Koninklyke West Indische Maatschappij, arrived at New York this week, being the first of four new ships going in service between New York, Paramaribo and Dutch Guiana, calling at intermediate ports. The *Suriname* was built by the Nederlandsche-Scheepsbouwmaatschappij in Amsterdam, is 350 ft. in length, 42 ft. in breadth, and has a gross tonnage of 3,500 and a speed of 13½ knots. She will carry passengers in addition to freight.

The other ships in the service will be the *Coppename*, *Sarramacca*, and *Marowayne*.

A cable message received this week by the North German Lloyd Line announced that the steamship *Kronprinzessin Cecilie* had arrived at Plymouth after another record-breaking trip. Her time was 5 days, 11 hours and 43 minutes, and average speed, 23.35 knots. The days' runs were 527, 560, 552, 540, and 352 miles.

The need of a full-rigged ship large enough to accommodate 300 or more cadets is again brought to the attention of the committee on the nautical school in the annual report of the New York Nautical School recently issued by the Board of Education. Though admitting that the addition of the Newport was of considerable help, it is claimed that her size is inadequate for the results that the nautical committee expected to accomplish. Courses in steam and electricity have been added to the curriculum. The attendance at the nautical school during the year 1907 was 169.

The British steamship *Beta*, Capt. Pye, from Halifax for Bermuda, Turk's island and Kingston, was totally wrecked off Turk's island on Sunday, the passengers and crew being saved. The *Beta* was valued at \$125,000, and was insured.

A bill to abolish compulsory pilotage on all coasting vessels in the waters of Virginia has been presented to the senate of that state, after having been favorably reported by the house. It is believed that the bill will be passed and become a law, as it stands. The bill proposes to abolish coastwise pilotage on sail vessels by a moderate increase on foreign tonnage.

John S. Emory & Co., of Boston, will build at Bath a single-deck four-masted schooner of 170 ft. in length and 14 ft. depth of hold, for Capt. John H. Bray and others, of Milbridge, Me. The vessel is to carry 1,250 tons of coal or 700,000 ft. of lumber on a draught of 16 ft.

The converted yacht *Hist*, which acted as convoy to the flotilla of submarines which left New York on the 16th, was floated at 2 o'clock on the 23rd, after having been aground on Cove Point bar since the 19th. She was floated by the combined efforts of the *Des Moines* and government tugs, apparently undamaged.

Violations of the navigation laws at sea at night by a lack of display of lights required is commented on by Capt. Maddox, of the American liner *Haverford*, two instances being observed on the last voyage of the *Haverford* between Liverpool and Philadelphia.

Capt. Lacey and eight seamen of the Philadelphia schooner *Edward J. Berwind* were landed in New York Saturday by the Cunard liner *Campania*, from Liverpool. They were picked up at sea by the British steamer *Mercedes de Lirringa* and landed at Liverpool.

The *Berwind* was bound from New Orleans to Philadelphia with a cargo of dry cypress when abandoned. She was subsequently set on fire by a passing vessel, but her fate since then is unknown.

The prize crew placed on board the abandoned Swedish bark *Norrköping* from the British steamship *Chiripo* have arrived at the Bermuda islands with the vessel. The hull and cargo were in good condition, but the main and mizzen masts were practically gone.

PARTICULARS OF NEW SHIP YARD.

The plans are about completed for the ship yard which is to be established opposite Norfolk, Va., by a recently chartered company headed by Edwin S. Cramp, formerly of the William Cramp & Sons Ship & Engine Building Co., Philadelphia.

The contracts for actual construction will be let in a few weeks and they will provide that the work shall be completed before Jan. 1, 1909, at which time it is the purpose of the company to open for business. The

corporate name of the concern is the Cramp Ship Building Co.

The three railway dry docks will have capacities of 1,500 tons, 500 tons and 600 tons, respectively, and the construction of another dry dock of 4,000 tons capacity is under consideration.

It will be possible to berth about 20 vessels at the yard exclusive of the dry docks as there is to be over 2,500 ft. of wharfage on the three water bound sides. This will afford opportunity for repairs to craft not requiring to be dry docked.

Six large buildings will be erected for the indoor processes and all of them will be of steel and tile construction and as near fireproof as it is possible to make them. Both the buildings and the machinery which is to be installed in them will be of the most modern types. The machine shop will occupy the largest building in the group. It will be 290 ft. long and 60 ft. wide and two stories high. The woodworking plant, saw mill and pattern shop will occupy another building two stories high, which is to be 80 ft. long and 40 ft. wide. Its companion building will be the boiler and engine house, with dimensions practically the same. Another building 40 ft. long and 30 ft. wide is to be used as an electrical storeroom and work shop and two more buildings 30 by 40 ft., for housing the docking machinery, are to be erected. A residence which is standing upon the site of the yard is to be used for a temporary office building.

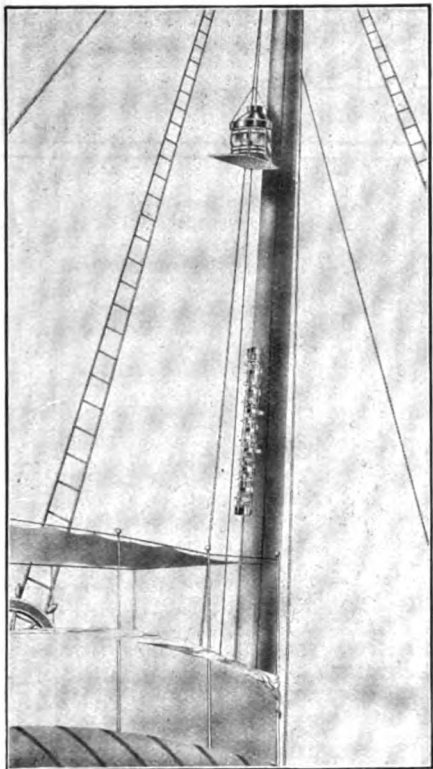
The bulkheads and wharves are to be constructed of creosoted piles and the foundations of the docks and of the machinery and building are to be laid on piles also.

The cost of the construction of the railway dry docks and the buildings will be about \$300,000, which includes the large amount of dredging which will be necessary before deep-draught vessels will be able to reach the yard.

The present plans of construction require about one-half of the property acquired and further development of the plant is contemplated at a later date.

The cost of the plant completed, including the price paid for the site, will approach the million dollar mark.

The bulk freighter *J. E. Upson*, building at the Cleveland yard of the American Ship Building Co., for the Wilson Transit Co. of Cleveland will be launched at 11:30 o'clock on Saturday next.

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and a quarter—75 seconds—two ships moving at 12 miles per hour will approach each other half a mile.

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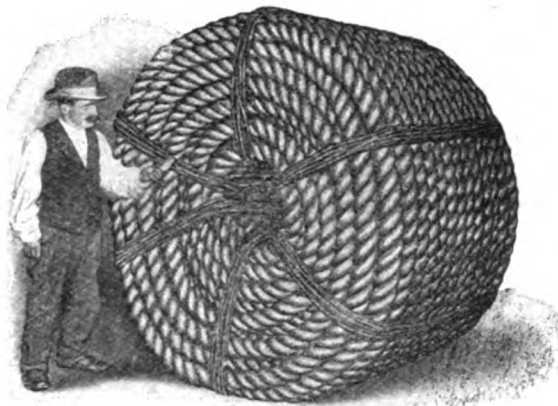
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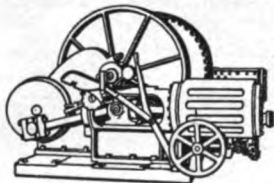
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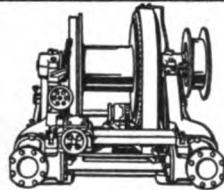
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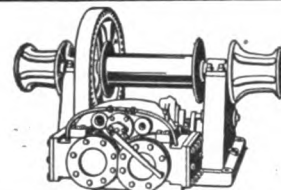
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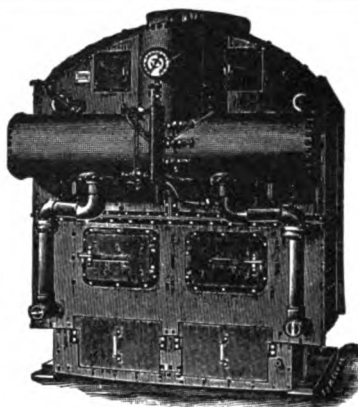


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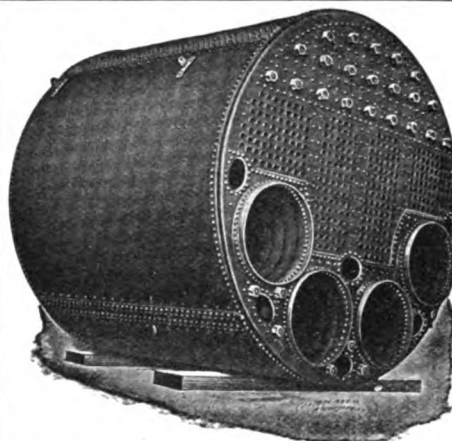
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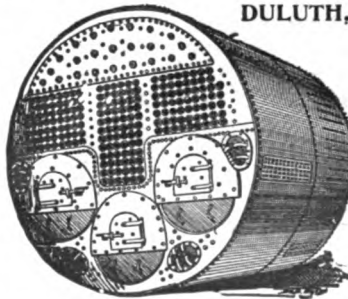
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U. S. Engineer Office, Jones building, Detroit, Mich., Feb. 4, 1908. Sealed proposals for widening St. Mary's Falls Canal will be received at this office until 3 P. M., March 5, 1908, and then publicly opened. Information furnished on application. Chas. E. L. B. Davis, Col. Engrs.

U. S. Engineer Office, 57 Park street, Grand Rapids, Mich., Feb. 4, 1908. Sealed proposals for repair of South Pier at Charlevoix Harbor, Mich., will be received here until 3 P. M., March 5, 1908, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

U. S. Engineer Office, Buffalo, N. Y., Jan. 14, 1908. Sealed proposals for the construction of concrete walls for Ship Lock, Black Rock Harbor, at Buffalo, N. Y., will be received at this office until 11 o'clock a. m., March 14, 1908, and then publicly opened. Information furnished on application. H. M. Adams, Col. Engrs.

U. S. Engineer Office, 57 Park street, Grand Rapids, Mich., Feb. 24, 1908. Sealed proposals for extension and repair of south pier at Frankfort, Mich., will be received here until 3 P. M., March 25, 1908, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

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COMPASSES.

Ritchie, E. S. & Son.....

.....Brookline, Mass.

COMPOUND—PIPE JOINT.

U. S. Graphite Co....Saginaw, Mich.

CONDENSERS.

Great Lakes Engineering Works...

.....Detroit.

Wheeler Condenser & Engineering

Co.New York.

CONTRACTORS FOR PUBLIC WORKS.

Breymann Bros., G. H.....Toledo.

Buffalo Dredging Co.....Buffalo.

Dunbar & Sullivan Dredging Co....

.....Buffalo.

Griscom-Spencer Co., New York City.

Great Lakes Dredge & Dock Co....

.....Chicago.

Starke Dredge & Dock Co., C. H...

.....Milwaukee.

Sullivan, M.Buffalo.

CONVEYORS (Portable).

Spence Mfg. Co.....St. Paul, Minn.

CORDAGE.

Baker & Co., H. H.....Buffalo.

Buffalo Ship Chandlery & Supply Co.

.....Buffalo.

Columbian Rope Co...Auburn, N. Y.

Upson-Walton Co.....Cleveland.